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SIMON (M.). **The yellows disease of Sugar Beets.**—*Publ. Inst. belge Amélior. Better.*, viii, 1, pp. 20–22, 1940. [Abs. in *Facts ab. Sug.*, xxxv, 12, p. 43, 1940.]

The virus of sugar beet yellows, described as one of the principal diseases of the crop in western Europe [*R.A.M.*, xix, p. 187], is stated to be spread by *Aphis fabae*, which acquires the virus by sucking one of the many plants harbouring it, e.g., spinach. In the beet-growing regions of Belgium, however, the chief sources of infection appear to be silos and feed lots, where the crowns of diseased plants of the preceding crop put forth sprouts on which the aphid feeds before flying out to the fields. The losses from yellows may be reduced by eliminating these reservoirs of the virus, the early planting of non-bolting varieties, and the maintenance of a plentiful supply of soil moisture by irrigation.

WALKER (J. C.), DELWICHE (E. J.), & SMITH (P. G.). **Pea seed treatment with chemical dusts.**—*J. agric. Res.*, lxi, 2, pp. 143–147, 1940.

The results of experiments conducted in Wisconsin from 1936 to 1939, inclusive, showed that the beneficial effects of treating pea seeds with either red copper oxide or 2 per cent. ceresan dusts will vary with the season and locality [cf. *R.A.M.*, xix, p. 257]. Neither treatment had any effect on the starch-seeded Alaska variety at any time during the four-year experimental period. In a Colby silt loam soil of relatively high water-holding capacity at Marshfield, significant improvement in stand was achieved in only one out of four years (that of heaviest precipitation) and only with red copper oxide. In tests in 1938–9 with silt loam soil from Sturgeon Bay and Madison, consistently greater benefits from seed treatment were observed in the moister soil from Sturgeon Bay. The early and late sowings in this locality in 1938, however, both showed improved stands after treatment, although the rainfall during the early sowing was 2·34 in. as compared with 0·44 in. during the late.

It is concluded from these results that the conditions favouring [unspecified] cotyledon decay during germination occur periodically, but not necessarily consistently, under average Wisconsin conditions. They do not seem to affect the starchy-cotyledoned forms, but may

reduce the stands of the sugary-seeded varieties. Of the two materials tested, red copper oxide proved to have a beneficial protective influence on all varieties of the latter group, while ceresan was less effective.

SMIETON (MARGARET J.) & BROWN (W.). **Botrytis disease of Lettuce, its relation to damping-off and mildew, and its control by pentachloronitrobenzene dust.**—*Ann. appl. Biol.*, xxvii, 4, pp. 489–501, 1 pl., 1 graph, 1940.

Extending the experiments on the control of the *Botrytis* [*cinerea*] disease of lettuce started by W. Brown in 1934–5 [*R.A.M.*, xv, p. 196] for four more years, the authors tested the effect of treating spring lettuces, sown in cold frames in the autumn and transplanted into the open in early spring, with pentachloronitrobenzene (referred to as Pcnb) in the form of a dust containing 80 per cent. of talc or slaked lime as filler. [In a footnote it is stated that this dust, referred to in the earlier paper as brassisan, is now termed folosan [ibid., xix, p. 130], the former name having been transferred to another preparation containing trichlorodinitrobenzene.] The dust was worked into the top soil of frames to a depth of about 2 in. at the rate of 1 oz. per sq. yd. or sprinkled on the surface just after sowing; in addition the seedlings were dusted several times before transplanting. The treatment consistently gave large increases in stand of seedlings (902 to 2,550 plants per frame as against 106 to 1,558 in the untreated series) and in the percentage of subsequent survivals in the field (58 to 86 as against 15 to 55 in the controls). The date of maturity was, on the other hand, delayed by up to seven days in the treated plants.

Apart from *B. cinerea* a number of other fungi are responsible for losses of plants in the frame and later in the field. Of these, damping-off caused by *Rhizoctonia* [*Corticium*] *solani* was effectively controlled by adding Pcnb to the covering soil at the rate of 24 to 60 oz. per cu. yd. This reduced the percentage of damped-off plants to from 1·7 to 5 as compared with from 35 to 93 in the untreated control and a further experiment showed the dose could be reduced to 12 oz., but it was valueless for the control of pre- and post-emergence damping-off caused by several [unspecified] species of *Pythium*. Mildew (*Bremia lactucae*) may in some seasons cause serious damage, and, as well as damping-off, is potentially important in providing dead leaf tissue on which *Botrytis cinerea* is liable to develop under suitable conditions.

Experience showed that the dust may cause a visible check to growth, which is greater the smaller the plants, the lower the temperature, and the heavier the dose applied. No applications should, therefore, be made while the seedlings are very small, except for a light dusting should damping-off or mildew be observed. From the end of December onwards moderate applications can be given at three- to four-week intervals, and a thorough final one just before the plants are pulled for transplantation. Replicated experiments showed that three applications at the rate of ¼ oz. per sq. yd. give adequate disease control for the four to five months during which the seedlings are in the frame. With regard to the control of *Bremia lactucae*, the fungicidal efficiency of Pcnb was materially reduced when talc was replaced by lime as a filler. After the severe frost of 1940, dusted plants showed more injury than undusted,

this effect being, however, less noticeable in other seasons. During severe frost dusting should, therefore, be suspended.

PRYOR (D. E.). **The effect of some mineral nutrients on the development of clubroot of crucifers.**—*J. agric. Res.*, lxi, 2, pp. 149–160, 3 figs., 1 diag., 1940.

The effect of sulphur, nitrogen, and potassium nutrition on the development of club root (*Plasmodiophora brassicae*) [*R.A.M.*, xix, p. 449] in susceptible, resistant, and immune strains of crucifers was studied under controlled greenhouse conditions in Wisconsin. Infection was secured in sand cultures by inoculating the potted plants at the first true leaf stage and a fortnight later with the spore suspension applied to the surface of the sand with a pipette. The percentage of diseased plants was comparable to that obtained in infested, acid soil. The inoculated plants developed either the usual normal type of relatively smooth clubs or small galls, 1 or 2 mm. in diameter, appearing usually, but not always, at the base of a branch root. The results of these tests indicate that varying nutrition has a most pronounced effect on disease development in susceptible plants, but does not influence resistance in immune varieties such as the Purple Top Milan turnip, which developed no signs of club root under any conditions of nutrition brought about in these experiments. The percentage of susceptible plants developing clubs was in general increased slightly over that of plants receiving the complete nutrient solution by an abundance of potassium, more by an abundance of nitrogen, and most by a deficiency of sulphur or nitrogen, the latter effect being greater in resistant plants. The percentage was decreased markedly by potassium deficiency. In the case of resistant plants club development was increased somewhat by high supplies of nitrogen, it was greatest when sulphur or nitrogen were deficient, and was definitely decreased by lack of potassium, while the results obtained with other nutrition series were not conclusive. Since nitrogen starvation, which did not appreciably lower the mustard oil content of crucifers, increased club root infection to about the same degree as sulphur starvation, which did greatly lower it, it is concluded that sulphur oils are not essential to the host in preventing or retarding club root development.

METCALFE (G.). **Bacterium rhaponticum (Millard) Dowson, a cause of crown-rot disease of Rhubarb.**—*Ann. appl. Biol.*, xxvii, 4, pp. 502–508, 1940.

In this paper a detailed account is given of a crown rot disease of Victoria rhubarb stated to be prevalent in cottage gardens in central Yorkshire and believed to be identical with that described by Millard [*R.A.M.*, iii, p. 628]. Isolations from diseased rhizome and rotting bud tissue yielded various bacteria, fungi, and eelworms, but the only pathogenic organism among them corresponded with Millard's *Bacterium rhaponticum*, although the measurements of single cells were about 1·2 to 1·5 by 0·5 to 0·8 $\mu$ and thus smaller than those given by Millard. The author gives a revised description of the causal organism as follows: the bacterium possesses three to seven peritrichous flagella, which stain by Morton's method; it is not readily motile, although some good motile

preparations were obtained; it forms acids but no gas from arabinose, xylose, dextrose, levulose, galactose, mannose, sucrose, maltose, lactose, mannitol, glycerol, and salicin, and does not utilize starch; it forms acid on litmus milk, reduces nitrates, produces no indol in broth, no hydrogen sulphide, and does not liquefy gelatine. It grew at all temperatures from 0° to 37° C. and withstood drying for at least eight days and night temperatures of −5°. Some strains of the organism secreted a pink pigment and in others chromogenesis could be induced by subculturing. Passage through Cohn's solution suppressed the induced but not the natural chromogenesis. The pathogenicity of the organism was proved in inoculation experiments, a fairly saturated atmosphere being necessary for successful infection.

The eelworm *Anguillulina dipsaci* held by Johnson to be the primary cause of the disease (*Ann. appl. Biol.*, xxvi, p. 739, 1939), was found by the author to be present in all the naturally infected material examined, but in all the inoculation experiments typical rot was produced in the absence of *A. dipsaci*. It is, however, thought probable that *A. dipsaci* acts as an agent of infection by introducing the pathogen through the wounds it makes. In comparative studies it was shown that *Bact.* [*Erwinia*] *aroideae*, which resembles *Bact. rhaponticum* in its biochemical characters, differs from it in turning litmus milk red, liquefying gelatine, and being non-chromogenic. *Bact. rhaponticum* was shown to differ from the three 'soft rot' bacteria *E. aroideae*, *Bact. carotovorum* [*E. carotovora*], and *Bact. phytophthorum* [*E. phytophthora*] in its pathogenic faculties, and cannot be placed in the same group with them.

THOMAS (K. M.). **Detailed administration Report of the Government Mycologist, Madras, for the year 1939–40.**—18 pp., 1940.

The following information is presented in this report [cf. *R.A.M.*, xix, p. 258]. Of the 42 strains and selections of rice tested for their reaction to blast (*Piricularia oryzae*) at the Coimbatore Central Farm, Co. 4 proved to be the most resistant, followed by 11348, Co. 11, and 10998. In experiments to determine the influence of the planting date on infection, the maximum incidence of disease occurred in the October-sown plots and the minimum in those of November.

*Helminthosporium oryzae* [*Ophiobolus miyabeanus*] does not sporulate well in most standard media, but was found to do so in a maize meal-sand mixture and in potato dextrose plus tannic acid. Sporulation was further shown to be more profuse in Petri dish than in tube cultures, a thin layer of potato dextrose agar giving better results than a thick one. Cross-inoculation experiments with *O. miyabeanus* showed wheat and tenai [*Setaria italica*] seedlings to be equally susceptible with rice, but ragi [*Eleusine coracana*] and maize contracted little infection, and cumbu [*Pennisetum typhoides*] and sorghum none (except when wounded). The fungus further attacked the leaves and earheads of rice, *S. italica*, wheat, and barley, whereas oats, *E. coracana*, and maize developed only slight foliar infection. Both seed and soil were found to serve as sources of infection by *O. miyabeanus*, the incidence of disease contracted from either separately ranging from 14 to 20 per cent. and that derived from both simultaneously from 25 to 33. The

thermal death point of the pathogen was found to be 51° C. (10 minutes' exposure).

In an experiment in which 12 varieties of *E. coracana* were sown every month from January to December, the incidence of blast (*Piricularia* sp.) in the resultant crops was heavy in the June, July, and August sowings (39 to 81, 33 to 88, and 69 to 98 per cent., respectively), light in those of May and September, and nil in those of the remaining months. In cross-inoculation tests with strains of *Piricularia* from *E. coracana*, *S. italica*, and rice, those from *E. coracana* and *S. italica* infected their own hosts, two lines of wheat, oats, barley, maize, and *Dactylotenium aegyptiacum* [*E. aegyptiaca*], but not rice, whereas *P. oryzae* from rice attacked all the plants except *E. coracana*.

Comparative cultural studies on the agent of false smut of rice (*Ustilaginoidea virens*) showed that the best growth was made on Quaker oats.

In inoculation experiments with *Colletotrichum falcatum* on sugar-cane setts the maximum spread of infection within the sett occurred at between 30° and 34° C. The spores were killed by five minutes' exposure to a temperature of 51°, which was withstood, however, by the appressoria.

The Co. 205 and 434 sugar-cane varieties have maintained their resistance to mosaic in trials extending over periods of seven and four years, respectively, while Uba (S.H. 38), Uba (S.H. 281), Co. 411, and Co. 422 have also remained free from infection for two, two, three, and two years, respectively.

*C. indicum* was found to penetrate cotton cotyledons both through the stomata and directly through the epidermis, the latter channel also serving for the invasion of the collar region. Penetration is effected some 18 hours after inoculation. Within a week of emergence from infested soil, seedlings from surface-sterilized H–1 cotton seed were all killed, and when the pots were re-sown a month later, 66 per cent. of the seedlings died. The optimum temperature for infection by *C. indicum* was shown to range from 20° to 30°. Only 1 per cent. of the delinted cotton seeds soaked in a spore suspension of *C. indicum* germinated, compared with 37 per cent. of the controls. Ceresan gave good control of seed infection in trays and pots without impairing germination, but failed to eliminate the fungus in plots when rain fell heavily at the time of sowing. The maximum incidence of infection by *C. indicum* was registered in soils with a 30 to 50 per cent. moisture content. The filtrates from two-day-old liquid cultures of the pathogen induced wilting of seedlings in 24 hours, the toxic effects increasing with the age of the cultures and culminating at four weeks in marginal desiccation and wilting in 12 hours. The toxin is not thermostable.

In cultural studies on species of *Phytophthora*, oospores of *P. parasitica* were formed on maize meal agar at 20°; *P. meadii* [ibid., xvi, p. 232] only formed these organs on pairing with *P. arecae*, and in *P. arecae* they only developed on pairing with strains of *Phytophthora* from citrus and Palmyra palm [*Borassus flabellifer*].

One monsoon (late July) treatment with 1 per cent. Bordeaux mixture proved very effective for the control of citrus leaf and fruit fall due to *Phytophthora* sp., but a considerable increase of yield

resulted from two applications of the same preparation, the first being given towards the end of May.

Seed treatment with ceresan (0·25 per cent., 30 minutes) effectively controlled the ginger rhizome rot due to *Pythium* spp., while the best means of preservation of seed ginger in pits was by 1½ hours' immersion in 0·1 per cent. mercuric chloride.

Little leaf of brinjal [eggplant] was transmitted by grafting to the following additional hosts: *Withamia somnifera*, potato, *Solanum pubescens*, and *S. seaforthianum*, and with the aid of *Eutettix phycitis* to *S. xanthocarpum*, *S. trilobatum*, and *Datura fastuosa*.

PHILLIPS (E. P.). **Control of crop and plant diseases. Annual Report of the Division of Botany and Plant Pathology.**—*Fmg S. Afr.*, xv, 177, pp. 519–520, 1940.

In this report on plant disease work in South Africa in 1940 [*R.A.M.*, xix, p. 195], the author states that seed of tomato strains from the United States bred for resistance to spotted wilt in California, when grown locally, gave rise to plants every variety of which was susceptible to kromnek [ibid., xix, p. 620; xx, p. 85]; the supposedly resistant red currant variety [*Lycopersicum pimpinellifolium*] showed 20 per cent. infection, and the remainder over 60 per cent.

Varietal resistance tests at Nelspruit have demonstrated that the Marvel tomato variety is the most resistant of those tested to *Fusarium* [*bulbigenum* var.] *lycopersici* [loc. cit.]. Preliminary studies indicated that the fungus is favoured by a low $P_H$ value of the soil, and that in the eastern Transvaal the figure ranges from 5·2 to 6·4. Experimental evidence indicated that it may prove economically possible to increase the $P_H$ value of the soil by means of agricultural lime and calcium cyanamide. The deleterious effect of fungal attack appears to decrease markedly with increase in the soil $P_H$.

During the summer, pine species in the Sabie Forest Reserve developed a severe outbreak of disease. *Diplodia pinea* [ibid., xviii, p. 656] was observed in a viable condition on all the affected trees, on fallen needles, on thinnings cut out two years before, and on standing trees which had been dead for four years. The severity of the attack was attributed to injuries caused by a severe hailstorm, succeeded by a period of misty weather. The effects of the disease were visible six weeks after the storm, and after three months considerable patches of trees were dead.

Wheat and barley foot rots due to *Helminthosporium sativum* and associated fungi and take-all due to *Ophiobolus graminis* [ibid., xix, p. 587] are likely to prove a limiting factor in production in grain-growing areas of the Transvaal, unless preventive measures are adopted.

*Puccinia antirrhini* now occurs on *Antirrhinum* [*majus*] in all parts of the Union [ibid., xix, p. 350] and will probably seriously affect the cultivation of this plant.

Tobacco leaf curl was found to occur naturally in petunias, while another form of the disease was associated with hollyhocks.

Between 1st August, 1939, and 31st July, 1940, 513,123 [citrus] trees were inspected in the Barberton, Pretoria, Rustenburg, Brits, and Waterberg areas of the Transvaal, and 1,468 showed the presence of

psorosis [ibid., xix, p. 196]; in the Cradock, Oudtshoorn, and Prince Albert districts of the Cape Province, 19,555 trees were inspected and 36 found affected.

Work at Nelspruit on [citrus] dry root rot [loc. cit.] has shown that the condition may be induced by certain soil treatments.

Between October, 1939, and February, 1940, a detailed survey was made in Cape Province of vineyards in districts affected by bacterial blight [*Erwinia vitivora*: ibid., xix, p. 384; xx, p. 44]. The survey covered a total of 30,881,602 vines and all registered nurseries were visited, comprising 507 in 17 districts. At the annual sales held at Stellenbosch, Paarl, and Worcester only vines from registered nurserymen were allowed to be sold, and steps were taken to see that the regulations governing the transport of vines were observed. The evidence indicates that if proper control of nursery material is maintained, distribution of the disease may be limited and further spread prevented. Only one new occurrence of the disease was recorded.

SIMMONDS (J. H.). **Report of the Plant Pathological Section.**—Ex *Rep. Dep. Agric. Qd, 1939–40*, pp. 10–11, 1940.

This report on plant disease work in Queensland [*R.A.M.*, xix, p. 458] includes the following items of interest. The lucerne root rot fungus *Helicobasidium purpureum* [loc. cit.] was recorded from a second locality during the year.

The control measures for squirter disease of bananas [ibid., xi, p. 794], originally worked out by the Plant Pathological Section, have been extensively practised with pronounced success in districts suffering losses from the disease.

In a further experiment on the control of brown spot [due to an unknown cause: ibid., xvi, p. 451] and black spot [*Phoma citricarpa*: loc. cit.] of citrus, it was shown that home-made cuprous oxide mixture (previously referred to as colloidal copper) [ibid., xvii, p. 376] is effective at a strength of 3 to 40 or even 3 to 80 in controlling melanose [*Diaporthe citri*: loc. cit.] also. A repetition of previous outbreaks of lemon rind breakdown is reported. In addition to the influence of prolonged periods of rain or dew deposition, a nutritional factor is now considered to be of fundamental importance in connexion with this disorder.

Field observations on the brown speck of pineapples, due to *Penicillium* sp. and *Fusarium* sp. [ibid., xix, p. 459], indicated that an insect agency is not necessary for penetration to take place. The degree of infection with pineapple marbling [loc. cit.] is stated to be determined by age of the fruit, meteorological conditions, and certain obscure characteristics of the flower and fruit.

A detailed survey of practically all farms from which serious losses from pineapple water blister (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) [loc. cit.] were being reported showed a definite correlation between the cleanliness in and around the packing shed and the extent of losses sustained. In laboratory tests on the control of side [as distinct from stem-end] infections by *C. paradoxa*, a solution of benzoic acid in alcohol was very effective, but its value from an economic standpoint has not yet been determined. Top rot of pineapples (*Phytophthora*

*cinnamomi*) [ibid., xiv, p. 458] is stated to cause increasing losses in young pineapple plantings.

Previous conclusions regarding the pathogenicity of *Ascochyta caricae* and an [undetermined] species of *Gloeosporium* to papaw were confirmed, the latter fungus being the more important of the two. A species of *Phomopsis* was found to cause a distinctive type of spotting in papaw during the spring months. Evidence was obtained that dead leaf stalks and other parts constitute the source of inoculum of these fungi. Papaw die-back [loc. cit.] was generally less prevalent than in 1939, but in some areas losses of from 8 to 10 per cent. of the plants were observed. Yellow crinkle of papaw [loc. cit.] was unusually prevalent, up to 30 per cent. of the trees being affected in some plantings. Field observations showed that powdery mildew of papaw [*Sphaerotheca* sp.: ibid., xv, p. 281] may be active and harmful as late as the end of September. It is advisable, therefore, to prolong dusting operations accordingly.

The results obtained with soil treatment with sulphur for the control of bacterial wilt of tomatoes [*Bacterium solanacearum*: xiv, p. 337] were inconclusive. In varietal resistance trials the most promising proved to be Sensation, Homer, Marvana, and Denisonia. Widespread outbreaks of a bacterial spot of tomatoes apparently caused by *Bact. vesicatorium* are reported.

Chlorosis in hoop pine [*Araucaria cunninghamii*: ibid., xix, p. 460] nurseries was shown by means of leaf injections to be due in most cases to an iron deficiency closely linked with high salt concentrations in the water used for irrigation.

On pp. 11–12 of this report H. K. Lewcock gives results of pineapple disease work. In further trials on the control of 'crookneck' [ibid., xix, p. 459] soil applications of copper and zinc together gave a better response than either zinc or copper alone. Copper treatment retarded the appearance of 'crookneck' symptoms by three months, but subsequently disease developed in all plots except in those treated with both zinc and copper. Plants treated with copper grew consistently at a faster rate than control plants receiving equivalent amounts of fertilizer, and, in absence of 'crookneck', the leaves were broader, deeper in colour, and more spreading. Inoculation experiments showed that pineapple fruits harvested from plots receiving no added nitrogen during growth were more susceptible to infection with the water blister fungus *C. paradoxa*, than those from plots receiving the heaviest applications of sulphate of ammonia (4,300 lb. per acre), thus contradicting the view prevalent among growers that heavy fertilizing with sulphate of ammonia leads to increased losses from this disease. In further investigations of pineapple black heart [ibid., xix, p. 459] a correlation was found to exist between the sugar-acid ratio of the fruit tissues and the occurrence of the disease. Fruits relatively high in acid content but low or moderate in sugar developed black heart under conditions where fruit with a low acid but the same sugar content remained sound. Since decomposition of acids and accumulation of sugars occur at the same time during the final stages of ripening, it is concluded that the development of black heart can be correlated with a derangement of the normal ripening process and the immobility of the sugar contained in the leaves. The

nitrogen content of sound fruit was found to be appreciably higher than that of diseased, and a positive correlation apparently exists between the carbohydrate and nitrogen contents.

LARTER (L. N. H.). **Report of the Plant Pathologist.**—*Rep. Dep. Sci. Agric. Jamaica, 1939–40*, pp. 22–23, 1940.

During the period under review [cf. *R.A.M.*, xix, p. 260], Panama disease of bananas (*Fusarium* [*oxysporum* var.] *cubense*) continued its spread through the plantations, the number of cases treated being 906,613, representing about the same percentual increase as for the last three years. Infected planting material is no doubt still largely responsible for the dissemination of the disease.

In a report by the Leaf Spot Control Officer on pp. 23–24 information is given concerning the administration and expenditure of the Banana Leaf Spot Control Board, appointed in July, 1939, to supervise the outlay of a grant of £200,000 made by the Government to the banana industry with a view to the establishment of control measures against leaf spot (*Cercospora*) [*musae*]. The area that can be sprayed under the scheme with Bordeaux mixture or perenox (provided by the Board) has been greatly increased by economies in procedure effected as a result of experience gained during the operation of the project. The total outlay from 8th August, 1939, to 30th March, 1940, amounts to £96,981 1*s.* 7*d.*

Bronze leaf wilt [ibid., xx, p. 112], the most serious disease of coconuts in the Island, is still spreading in the north-west, where some 1,000 acres out of the 4,000 affected have been destroyed since the beginning of the epidemic in 1934.

Direct control of pimento (*Pimenta officinalis*) rust (*Puccinia psidii*) [ibid., xix, p. 261] appears to be impracticable, but so far the disease has not developed in a serious form at altitudes below 1,000 ft., and some degree of recovery has been observed at higher elevations.

Among other diseases investigated during the period covered by the report were wither tip of lime (*Gloeosporium limetticolum*) and *Zinnia* [*? elegans*] leaf spot (*C. atricincta*) [ibid., xvi, p. 128].

**Fifty-third Annual Report Colorado Experiment Station 1939–1940.**—61 pp., 1940.

The following items of phytopathological interest occur in this report [cf. *R.A.M.*, xix, p. 328]. At the close of a two-year test period, Montmorency sour cherry trees heavily mulched with straw remained virtually free from chlorosis, which severely affected 12 per cent. of those grown under continuous clean cultivation.

Losses from bacterial ring rot of potatoes [*Bacterium sepedonicum*: see below, p. 176] may be minimized by the use of disease-free seed, the disinfection of cutting knives, the warming-up of seed before planting, the discarding of all slow-sprouting and dormant tubers, and seed treatment after cutting.

Lines of onions withstanding infection by purple blotch [ibid., xiv, p. 222] are now available, and are being used to develop varieties combining resistance to this disease and to thrips infestation.

KEVORKIAN (A. G.). **Plant-disease investigations.**—*Rep. P.R. agric. Exp. Sta., 1939*, pp. 117–119, 2 figs., 1940.

During the period under review [cf. *R.A.M.*, xix, p. 201], *Cercospora musae* was observed to be present in isolated banana plantations over a wide area of Puerto Rico and the Caribbean zone, no serious losses, however, having yet been reported in connexion with the disease.

A new disease of vanilla, involving the abscission of the undeveloped flowers and pods, was investigated at Villalba and Mayaguez, 31 per cent. of the 250 plants examined in a pollination test at the former place being affected. The first symptoms usually appear at the apical end of the racemose inflorescence, affecting the young undeveloped flower buds, and extend towards the proximal end of the peduncle, causing necrosis and darkening of the tissues of the successive buds encountered. Flowers that have reached maturity before the onset of infection are shed, while in the case of young pods developing from the pollinated blossoms, necrosis starts at the proximal and advances towards the distal end. Affected young pods fall prematurely. The disease may also assume another form, in which small, dark spots are produced on the young pods or on the unfertilized ovaries of the epigynous flowers, and gradually expand until the proximal ends of the pods shrivel and abscission takes place. This type of infection, affecting only individual pods and not the entire cluster, is less serious than that first described. Attempts to demonstrate the pathogenicity of various fungi isolated from the diseased tissues have so far given uniformly negative results.

GRANOVSKY (A. A.). **The relation of subterranean insects to the Raspberry crown gall.**—*Hoosier Hort.*, xxii, 5, pp. 67–69, 1940.

In experiments in progress since 1931 at the Minnesota Agricultural Experiment Station, 1,000 raspberry plants from seven to ten fields were examined annually for crown gall (*Bacterium tumefaciens*) infection, the following percentages of which were found in certain rotations: after small grains, 2·88; lucerne, 5·35; grains with a considerable proportion of weeds, 7·47; Kentucky bluegrass [*Poa pratensis*] pasture (four fields), 46·57, 54·87, 35·43, and 23·65, respectively; old raspberry plantation, 5·30; and two-year sweet clover [*Melilotus*], 2·13. The great abundance of insects in raspberry plantations established on bluegrass sod is believed to be responsible for the high incidence of crown gall, the agent of which enters the roots through the injuries inflicted by white grubs, wireworms, larvae of root-feeding beetles, maggots of fungus gnats and of other Diptera, soil nematodes, and earthworms.

NEISH (A. C.) & HIBBERT (H.). **Effect of crown gall formation on the chemical composition of Beets.**—*Canad. J. Res.*, Sect. C, xviii, 12, pp. 613–623, 1940.

Analyses made in Canada of the tumorous tissue produced on beet by inoculation with *Phytomonas* [*Bacterium*] *tumefaciens* [*R.A.M.*, xvi, p. 303; xvii, p. 285], normal tissue of tumorous beets, and that of healthy controls dried at 60° C. in a vacuum oven, showed the following changes in the chemical composition of diseased roots, the results

being expressed as percentages of dry matter. The tumours have a higher content of crude protein, ether extract, starch, pectins, pentosans, cellulose, lignin, methoxyl, polyuronides (of holocellulose), and total ash than healthy beets, although the latter have a considerably higher content of sucrose. The normal tissue of diseased plants was intermediate in composition between healthy and tumorous tissue, except that it had the lowest amount of pectins and total uronic anhydride. The average undried infected beet root was found to be heavier (26·07 gm.) than the healthy one (17·97 gm.) and to contain only about half as much sucrose as the latter, but a greater total amount of solid matter. The cells of the tumours proved richer in protoplasm than those of mature normal tissue. It is concluded from these results that the crown gall organism stimulates the growth of tumour cells only; that the cells of the tumours actively convert sucrose into new protoplasm and cell wall material, one of the major metabolic processes in tumours being the conversion of sucrose into protein; and that the increased dry weight of tumorous roots is due to synthesis in the tumours, the rest of the root being stunted.

Voelcker (O. J.). **A review of Cacao selection in the Cameroons.**—*Trop. Agriculture, Trin.*, xvii, 12, pp. 223–225, 2 graphs, 1940.

Records taken at the German cacao plantation 'Westafrikanische Pflanzungs-Gesellschaft Victoria', in the British Cameroons, from 1930 to 1933 indicate that pod colour is in no way related to the susceptibility of cacao to the pod disease [*Phytophthora palmivora*: *R.A.M.*, xvii, p. 297], which is stated to destroy approximately 50 per cent. of the crop.

Sukhov [Soukhoff] (K. S.) & Sukhova [Soukhova] (Mme M. N.). **Interrelations between the virus of a new grain mosaic disease (zakuklivanie) and its carrier Delphax striatella Fallen.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xxvi, 5, pp. 479–482, 1940.

In continued studies on the 'zakooklivanie' [pupation disease: *R.A.M.*, xviii, p. 666; xix, p. 336] at Omsk [West Siberia] in 1939, the authors reared a non-infective generation of *Delphax* [*Delphacodes*] *striatella*, the vector of this virus disease [loc. cit.] on healthy oats grown in isolation. The oat plants remained healthy in spite of the large numbers of these 'sterile' insects, thus showing that the pupation disease is not due to a toxic effect produced by the insect. The infectivity of the pupation disease was proved when larvae of some of these insects were placed on diseased oats and after varying periods transferred to healthy plants, with the result that from 7·6 to 70 (average 32·2) per cent. of the larvae were found to have become infected.

The incubation period in the insect varied widely, averaging from 12 to 16 days, but it was never less than six. Owing to the length of the incubation period, the larvae in their various instars showed a different rate of infection, which was practically nil in the first, but increased with each subsequent instar and reached its maximum in the imago. The rate of infection, however, never exceeded 37 per cent. either under laboratory or field conditions. The larvae were most liable to become infected in their early (first and second) instars, while in the fifth

instar or the imago stage the insects were practically immune. This may furnish an explanation of the fact that in oat fields completely infected by the disease, the number of infective insects diminishes gradually, dropping from 30 to 4·7 per cent. by the end of June. But even in their earlier instars the larvae did not easily become infected; none showed traces of infection after one hour's feeding on diseased oats and only an insignificant percentage after six hours, the highest percentage being reached after two to three days. On the other hand, the infection is easily transmitted by infected insects to healthy plants, in some cases in five or ten minutes. The virus does not multiply in the insects, and in time they lose their infective capacity. That the virus is not transmitted to the next generation was proved by an experiment in which the eggs of ten infected females were transferred to healthy oat plants, more than a hundred larvae being obtained from them; none of these larvae carried the infection.

The ratio of infected insects varied with different fields and different crops in direct proportion to the amount of infection in a given field and crop. Thus, in a field of early oats infected to the extent of 100 per cent., the ratio was between 30 and 37 per cent.; on late oats infected to the extent of 25 per cent., it was 8·5 per cent.; while it was only 4 per cent. on rye, which is generally far less susceptible to infection. When 108 larvae, collected from dry oat stubble on a fallow land devoid of any vegetation just as they were emerging from their winter anabiosis, were transferred to healthy oats growing in isolation, 20·3 per cent. of the larvae were found to be infected. This is taken to indicate that the virus overwinters largely in the body of the insect. Later on, another possibility of overwintering was found in the perennial grasses, such as *Agropyron repens* and *Bromus inermis*, which were, however, infected only to the extent of less than 0·01 per cent. and therefore could not constitute a significant mode of overwintering. The virus was furthermore discovered in the annual weeds *Setaria viridis* and *Panicum* [*Echinochloa*] *crus-galli*, the former representing a serious source of infection because very susceptible to the disease and very attractive to the vector. In experiments with rice, 15 per cent. of the material was successfully infected, while attempts to infect soy-bean failed. The penetration of the virus into the tissues of the oat plant was found to proceed at a rate of 7 cm. per hour.

Sukhov [Soukhoff] (K. S.) & Petlyuk (P. T.). **Delphax striatella Fallen as vector of the virus disease 'zakuklivanie' in grains.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xxvi, 5, pp. 483–486, 1940.

Investigations into the life habits of the vector of 'zakooklivanie' [pupation disease: see preceding abstract], *Delphax* [*Delphacodes*] *striatella*, showed that the larvae of this insect overwinter on weeds and grasses in field boundaries and meadows adjoining oat and other cereal fields harvested the preceding year. More larvae were found near the boundaries of the fields than further away from them, and as far as could be ascertained, the insects followed the direction of the wind. An oat field protected by a gauze fence 2 m. high escaped infection and no insects were found in it; unprotected oat fields, on the other hand, were infected to an extent of 17 per cent. It is suggested that live hedges may provide

considerable protection against the swarms of the insect. Thus, in an oat field infected to an extent of 90 per cent., patches surrounded by trees showed only 20 to 30 per cent. infection. The winged insects invaded only early crops, causing from 41·0 to 89·7 per cent. infection, while crops sown on and after 20th May and inspected at the same time as the early ones showed from 3·8 to 10·0 per cent. Furthermore, in the early crops the oat plants were almost entirely dwarfed, while in the late they were mostly of normal size. In years with exceedingly large populations of the insect, the difference in the rate of infection between the thickly and sparsely growing plants is not considered significant, but in seasons with a moderate population, the rate of infection in the former was 30 to 40 per cent. lower than in the latter. While the time and density of sowing therefore are not factors of primary importance, they exert an indirect effect on the reproduction and activity of the insect, and thus influence the rate of infection, which is obviously correlated with the density of insect population.

It is concluded from these observations that the primary task in controlling pupation disease is the destruction of its vector by applying insecticides to the narrow strips of ground where the insect overwinters.

Zazhurilo (V. K.) & Sitnikova (Mme G. M.). **Mosaic of spring cereals in the Voronezh district.**—*C.R. Acad. Sci. U.R.S.S.*, N.S., xxvi, 5, pp. 474–478, 2 figs., 1940.

In the present paper the symptoms of mosaic, previously reported on winter wheat and rye in the Voronezh district of the U.S.S.R. [*R.A.M.*, xix, p. 268], are described on spring crops, among which hard and soft wheats, oats (*Avena sativa*, *A. byzantina*, and *A. fatua*), and barley were attacked. The symptoms produced on spring cereals differ in some respects from those on winter wheat, although the pattern of the injured leaf blade is of the same type. The colour of the mosaic spots varied with the crop and even with the variety: it was yellow in hard wheats (often of a lemon shade) and green in soft; in oats and barley it was greenish-yellow, one or other of the two colours being predominant at times. In spring crops, the blade of the upper leaves was more affected with mosaic than those of the lower; in winter wheat the upper leaves were less affected than the lower ones or not at all. The diseased plants are retarded in their development and only rarely do they form grain. Most succumb at or before the earing stage. Profuse branching, characteristic of mosaic-infected winter wheat and of spring wheat infected with 'zakooklivanie' [pupation disease: see preceding abstract], was never observed in spring wheat, barley, or oats, nor were there antholysis and proliferation of flowers, typical of the latter disease in both winter and spring crops. No protein crystals were found in affected spring crops. All attempts to transmit the mosaic disease through the juice failed. Experiments with infested soil showed that infection is not spread by this means. The disease was successfully transmitted to spring cereals by the insect *Deltocephalus striatus* [ibid., xix, p. 268], 67·5 per cent. of the experimental plants developing infection when the insects were first fed on winter wheat 'rosettes', 32·5 per cent. when they were fed on infected winter wheat, 16·2 per cent. when the insects were taken directly from stubble of

spring and winter wheats, and between 22·1 and 11·4 per cent. when they were taken directly from various crops.

From the results of comparative studies it is concluded that one and the same virus, which may be appropriately called 'virus of winter wheat mosaic', is responsible for mosaic in both the winter wheat and the spring cereals, in spite of differences in the symptoms. On the basis of the symptoms observed in spring crops, the two closely related viruses of winter wheat mosaic and pupation disease can now be clearly differentiated. Profuse shooting appears in spring crops infected by the virus of pupation disease but not in those attacked by that of winter wheat mosaic. On winter wheat and rye, however, the viruses are not so easily distinguished, as profuse shooting may result from infection with either.

Johnson (T.) & Newton (Margaret). **Mendelian inheritance of certain pathogenic characters of Puccinia graminis tritici.**—*Canad. J. Res.*, Sect. C, xviii, 12, pp. 599–611, 1 fig., 1940.

In crossing and selfing studies with physiologic races of *Puccinia graminis tritici* [cf. *R.A.M.*, xix, p. 399] at Winnipeg, it was found that their pathogenic properties are inherited, for the most part, in accordance with Mendelian laws. On the wheat variety Kanred the '0' type of infection (absence of rust pustules) proved dominant to the '4' type (large rust pustules), since a race producing '0' when crossed with one producing '4' gave rise to a hybrid producing '0' type. Furthermore, when the hybrid race was selfed, the '0' type occurred approximately three times as frequently in the $F_2$ as the '4' type, the dominance being governed by a single factor. On the wheat variety Mindum the '4' type of infection was dominant to the '1' type (very small pustules) the former occurring about three times as frequently in the $F_2$ as the latter. On the emmer variety Vernal the '1' type of infection was dominant to the '4' type and recurred, in some crosses, about 15 times as frequently in the $F_2$ as the '4' type, rust behaviour apparently being governed by two pairs of factors. From the study of the $F_2$ populations of two crosses between races 9 and 36 it is thought probable that the factors governing the behaviour of the rust on Kanred, Mindum, and Vernal are distinct and inherited independently of each other. On Marquis wheat, the $F_1$ progeny produced an infection type closely resembling that of the maternal parent race, a phenomenon attributed to the influence of the cytoplasm of the maternal parent race. It is concluded from the results of these studies that the binucleate condition of the rust in its uredo stage does not in any way interfere with the expression of dominance and that the genes function in the same way as in uninucleate organisms. The crossing of races and selfing of hybrids may lead to recombinations of existing pathogenic characters that may result in the formation of new physiologic races.

Holton (C. S.). **Preliminary investigations on dwarf bunt of Wheat.**—*Phytopathology*, xxxi, 1, pp. 74–82, 4 figs., 1 diag., 1941.

The reticulate chlamydospores of the physiologic race of *Tilletia tritici* [*T. caries*] responsible for excessive dwarfing and tillering of wheat in Washington [*R.A.M.*, xvi, p. 166] failed to germinate under

any of the laboratory treatments tested, but the smooth, hyaline, haploid resting spores occurring among the reticulate forms frequently produced falcate secondary sporidia, borne either on short sterigmata or long, promycelioid structures; isolations from these sporidia gave rise to monosporidial lines of the dwarf bunt race. The mycelium developing from the single sporidia was usually haploid, though an apparently dicaryotic type occasionally arose. The unisexual nature of the monosporidial cultures is indicated by the typical dwarf bunt infection obtained with combinations of such lines and the absence of infection with individual lines. Hybrids between the dwarf bunt race and race 12 of *T. caries* and 9 of *T. levis* [*T. foetens*] were produced by the inoculation of winter wheats with combinations of monosporidial lines, evidence being secured of segregation for chlamydospore morphology and host dwarfing, though the actual mode of inheritance could not be definitely ascertained on the basis of $F_1$ progeny behaviour.

TURNER (ELIZABETH M.). **Ophiobolus graminis Sacc. var. avenae var. n., as the cause of take all or whiteheads of Oats in Wales.**—*Trans. Brit. mycol. Soc.*, xxiv, 3–4, pp. 269–281, 1940 (issued 1941).

This is a full discussion of the writer's studies on a hitherto undescribed variety of *Ophiobolus graminis*, highly pathogenic to oats in Wales, a preliminary announcement of which has already been noticed [*R.A.M.*, xx, p. 12]. Comparative studies on *O. graminis* proper from English wheat and the Welsh variety, which is named *O. graminis* var. *avenae* [with a Latin diagnosis], revealed significant differences in the length and septation of the ascospores, those from isolates of the former measuring 79 to 86 $\mu$ and having 8 to 8·5 septa, and those from isolates of the latter 101 to 117 $\mu$, with 10 to 12·5 septa. In inoculation experiments, Little Joss wheat was susceptible to infection by both groups of isolates, those from wheat being more virulent (up to 59 per cent. infection of secondary roots in one experiment as compared with a maximum of 35 per cent. for the oats strains) but the symptoms were similar in all cases. Oats (Victory, Scotch Potato, New Abundance, and Jubilee Black) proved highly resistant to the English inoculum, the maximum infection caused by which was 20 per cent. on Jubilee Black. On the other hand, the Welsh strain vigorously attacked all the varieties of oats, up to 97 per cent. infection being registered on New Abundance and Jubilee Black, while wheat was relatively resistant (maximum of 35 per cent. infection). Spratt Archer barley was more heavily infected by *O. graminis* from wheat (up to 76 per cent.) than by *O. g.* var. *avenae*, which caused a maximum of 43 per cent. infection.

TERVET (I. W.). **Problems in the determination of physiologic races of Ustilago avenae and U. levis.**—*Phytopathology*, xxx, 11, pp. 900–913, 4 graphs, 1940.

During the years 1933 to 1935 and 1936 to 1939, 17 collections of *Ustilago levis* [*U. kolleri*] and 63 of *U. avenae*, most of them collected in the Mississippi basin, were tested for physiological specialization in Minnesota on eleven varieties of oats. Some of the collections varied in their pathogenicity to the same variety in succeeding years, taking one to two years to become stable in their reaction. This variation may

be due to environmental factors at sowing time and also to the selective tendency of the host variety from which the inoculum was obtained to favour the production of biotypes to which it is most susceptible. Only five of the test varieties proved of value in separating physiologic races of oat smuts [*R.A.M.*, xix, p. 466], namely Anthony C.I. 2143, Gopher C.I. 2027, Rusota C.I. 2343, Iogold C.I. 2329, and Black Mesdag C.I. 1877, on which three races of *U. kolleri* and three of *U. avenae* were differentiated. The varieties Markton, Navarro, and Nakota were immune from all collections, while D.C. II–22–220 resembled Black Mesdag closely in its reaction to smut. Attempts to build up races of *U. avenae*, which attack slightly Bond and Fulgrain, by repeated increase of them on these two varieties have failed.

Melchers (L. E.). **The reaction of a group of Sorghums to the covered and loose kernel smuts.**—*Amer. J. Bot.*, xxvii, 9, pp. 789–791, 1940.

A wide range of variation in their reactions to several physiologic races of the covered and loose kernel smuts of sorghum (*Sphacelotheca sorghi* [*R.A.M.*, xix, p. 210] and *S. cruenta*) was shown by a selected group of 36 varieties in four years' (1931, 1932, 1935, and 1936) tests at the Kansas Agricultural Experiment Station [ibid., v, p. 88], Spur feterita C.I. 623, however, being the only one to rank as immune. Certain varieties and selections, e.g., Hegari C.I. 620, Hegari K.B. 36204, White Yolo C.I. 699, and Red Amber × feterita K.B. 2570 and 2501, were found to be more or less susceptible to physiologic races 1 to 3 of *S. sorghi* and 2 of *S. cruenta* [ibid., xi, p. 448; xiii, 227], but not to race 1 of the latter, whereas others, such as Early White milo C.I. 480, are attacked by *S. sorghi* and race 1 but not 2 of *S. cruenta*. Again, Standard Yellow milo C.I. 234, Dwarf Yellow milo C.I. 332, and Standard White milo C.I. 352 are highly resistant to physiologic races 1 and 2 of *S. cruenta* but susceptible to race 2 of *S. sorghi*, the so-called 'milo race'. Races 2 and 3 of *S. sorghi*, when used together with 1 to produce a composite inoculum, were found to sustain no loss of virulence as a result of the admixture, infecting their differential varieties in the ordinary way.

**Mould growth in sliced bread.**—*Aust. Baker*, xliv, pp. 11–14, 1940. [Abs. in *Aust. chem. Abstr.*, ii, p. 29, 1940.]

An account is given of experiments in Sydney on the control of bread moulds, very promising results in the elimination of which have been secured by the addition to the dough of sodium propionate [*R.A.M.*, xix, p. 589 and below, p. 173], though certain complications in the normal processes of manufacture were simultaneously introduced. White distilled malt vinegar (5 per cent.) was also found to serve as a mould inhibitor.

Bliss (D. E.). **Relation of soil temperature to Armillaria root rot in California.**—Abs. in *Phytopathology*, xxxi, 1, p. 3, 1941.

Sweet and sour oranges (*Citrus sinensis* and *C. aurantium*) grown in a greenhouse in Wisconsin tanks with constant soil temperatures from 10° to 38° C. were inoculated by placing in the soil, after the plant was

well established, a pure culture of *Armillaria mellea* on portions of citrus roots. Severe infection developed after 14 months at 10°, moderate at 17°, and slight at 24°. After seven months Lovell peach and Royal apricot seedlings and rooted geranium (*Pelargonium hortorum*) cuttings showed moderate infection at 10° and severe at 17° and 24°. At 31° the inoculum was not viable, and all the roots remained healthy; at 38° the roots also succumbed. The maximum root growth of the oranges was made at 24° and 31° and that of the peach seedlings at 10° and 17°, while the apricots and geraniums throve best at 17°. Rhizomorphs of *A. mellea* developed in glucose-potato agar at 10° to 31°, with an optimum between 20° and 24°. The mean weekly soil temperatures in a citrus orchard at Anaheim, California, in 1939, ranged from 9·4° to 29·4° at 6 in. and from 13·3° to 20° at 8 ft.

Wiehe (P. O.). **Le 'knife cut' du Cocotier.** [Coco-nut 'knife cut'.]—*Rev. agric. Maurice*, xix, 3, pp. 101–103, 4 figs., 1940.

A description is given of the symptoms of 'knife cut', an apparently hitherto undescribed coco-nut disease of obscure origin first observed in Mauritius in 1931, again noticed in 1937, and more closely investigated by the writer in 1938. Horizontal lesions resembling cuts, up to five per palm, exuding a brownish gum and frequently giving rise to adventitious roots, develop in acropetalous succession on the internodes of the trunk. The presence of *Ceratostomella paradoxa* in the apical leaf sheath tissues and in those of the periphery of the trunk is considered to be without etiological importance. The only control measures that can be recommended at the present stage of the investigations are regular inspections of the plantations, so that the lesions may be promptly detected, excised, and immediately burnt, the exposed portions of the trunk being disinfected by flaming with a torch and the application of hot tar, and the cavities subsequently filled with cement.

Knight (R. L.) & Clouston (T. W.). **The genetics of blackarm resistance. II. Classification, on their resistance, of Cotton types and strains. III. Inheritance in crosses within the Gossypium hirsutum group.**—*J. Genet.*, xli, 2–3, pp. 391–409, 3 graphs, 1941.

In Part II of these studies in the Sudan [*R.A.M.*, xviii, p. 796], over 160 varieties and strains of cotton are classified according to their resistance to blackarm (*Bacterium malvacearum*). In the American Upland group (*Gossypium hirsutum*) resistance ranged, in pure types, from grade '3' to '10' (grade '0' representing immunity and '12' full susceptibility) with some fully susceptible plants in types impure for resistance. The *G. purpurascens* group appeared to contain little, if any, resistance. In the *G. punctatum* group Gambia native and XBA 22039 showed outstanding resistance, the strongest so far found in New World types. Complete immunity was not found in any of the New World types, but it exists in some of the Old World species (Abu Hareira, *G. cernuum*, and *G. sanguineum*). Several of these results conflict with those obtained by other workers (e.g., Harland, Evelyn, and Burd at St. Vincent). It is suggested that in the absence of a standardized inoculation technique, the results are often based on differences in primary (seed) infection rather than on true tissue resistance,

and that the amount of primary infection is probably greatly influenced by the degree of seed fuzziness and plant vigour.

In Part III the type of blackarm resistance inherited in the crosses Uganda B. 31 × 514 and B. 31 × 513 (all three American Upland types) is described and the results are supported by the evidence obtained in unpublished work on crossing 513 with Sakel. Uganda B. 31 is stated to contain resistance factors $B_1$ and $B_2$ [loc. cit.] plus modifiers and to show grade '3' resistance; 514 contains no major resistance factors but numerous minor, chiefly recessive ones and shows grade '10' resistance. The first back-cross to 514 gave a bimodal curve with peaks at grades '4' and '9' and displayed an approximate 1 : 1 ratio instead of the 3 : 1 ratio expected. In $F_2$ and in the $F_2$ of this first back-cross, bimodal curves were again obtained, but these somewhat resembled the 12 : 3 : 1 ratio expected. The 513 parent, a selection from a Punjab American Upland importation with grade '5' to '6' resistance, contains factor $B_2$ together with several very weak factors for resistance. From the genetical data available it is concluded that it is impossible to combine the resistance of 513 with that of Uganda B. 31 in new strains.

Clouston (T. W.) & Andrews (F. W.). **Section of Botany and Plant Pathology, Agricultural Research Service.**—*Rep. Dep. Agric. For., Sudan Govt, 1938*, Part II, pp. 32–47 [? 1940. Received February, 1941].

During the period under review the incidence of cotton blackarm [*Bacterium malvacearum*: *R.A.M.*, xviii, p. 390] was generally low owing to the absence of late rains in most districts of the Sudan. The best results in the control of infection by chemical means were given by two hours' immersion of undelinted Gezira Research Farm seed in a 1 in 500 solution of mercuric chloride-iodide, followed by drying in the sun, the percentages of blackarm in three beds being reduced from 8·5, 18·5, and 43·2 to 0·06, 0·03, and 0·02, respectively. Using delinted seed and 1 in 1,000 mercuric chloride-iodide, the corresponding reductions in two beds were from 39·5 to 0·03 and from 54·4 to 0·008 per cent., respectively. The treatment did not impair germination. In two sets of test plots inoculation by spraying with *Bact. malvacearum*, resulting in an outbreak of mild to moderate intensity, caused a reduction of yield in Sakel of from 3·42 to 2·94 kg. per feddân [1 feddân = 1·038 acre] and in × 1530 of from 3·53 to 2·75 kg. per feddân. Leaf debris exposed on 5th May was found on 1st August to contain no infection, and similarly negative results were obtained in the examination of soil dust from the surface of two plots occupied by severely diseased plants [see next abstract].

The unidentified fungus referred to as 'XT' and related types again predominated among the isolations from the discoloured rootlets of wilted plants, other organisms present in which included *Fusarium*, *Cylindrocarpon*, and *Pythium* spp., *Rhizoctonia* [*Corticium*] *solani*, *Macrophomina phaseoli*, and culture RE/4–58 (probably a saprophyte), the last-named being also the principal occupant of rotted secondarily thickened roots. There is some evidence in favour of the view that the initial decay in cases of root rot is associated with adverse soil factors in the upper layers (18 to 30 in.) causing a restriction of soil moisture

circulation, the rot resulting probably from interference with the oxygen supply to the roots, or the dilution or removal of salt accumulations or root secretions. Rotting of this type may be an annual occurrence, but wilting only occurs when fungi of the *Rhizoctonia* group are present in the soil and invade the decayed tissues, eventually inactivating the root system. The optimum soil moisture content for shoot development in cotton plants growing in the top 4 in. of Gezira soil in petrol tins was found to range from 40 to 45 per cent., an excess being more conducive to poor growth and fungal infection than a deficiency. Although the weight of the fine roots produced at a soil depth below 2 ft. was only a third to a quarter of that attained by those in the surface 6 in., the latter were much more discoloured and of a less healthy appearance than the deeper ones. In tests in which seedlings grown in sterile sand were watered with (*a*) sterile soil extract and (*b*) a sterile mineral nutrient solution, with the addition of a small quantity of sterilized soil, the roots remained free from infection, whereas those receiving an admixture of unsterilized soil were fairly heavily invaded by fungi. The pathogenicity of individual root isolations may in future be tested by this method.

Brown (J. G.). **Wind dissemination of angular leaf spot of Cotton.**—Abs. in *Phytopathology*, xxxi, 1, p. 4, 1941.

The dissemination of angular leaf spot of cotton (*Phytomonas malvaceara*) [*Bacterium malvacearum*] by the wind was demonstrated over an area of 1,100 acres [? in Arizona], the inoculum being carried in dust. Extensive infection developed in cotton plants injured by a hailstorm a week before the gale. The circumstances attending these field observations rendered them fairly comparable to a planned laboratory test.

Luthra (J. C.) & Vasudeva (R. S.). **Mixed cropping and the Cotton root rot disease (Macrophomina phaseoli and R. solani).**—*Curr. Sci.*, ix, 10, pp. 466–467, 1940.

Particulars are given of experiments conducted at Lyallpur to determine the effect of mixed cropping on the cotton root rot caused by *Macrophomina phaseoli* and *R[hizoctonia = Corticium] solani* [*R.A.M.*, xix, p. 90], sorghum J 20 being sown broadcast between the rows of [*Gossypium*] *mollisoni* 39 in a thoroughly infested field in May, 1939, and a 2 ft. border of the cereal also sown all round the cotton crop. Another set of plots was sown with cotton alone for control purposes, and weekly counts were made of the incidence of mortality from root rot between 20th June and 11th September. The maximum percentage of dead plants in the pure cotton stand (12·47) was recorded on 26th June and 8th August, the total for the season (average of 13 counts) being 68·5, as against only 3·4 in the mixed stand. Similar results were obtained in experimental stands of mixed cotton of the same variety and *Phaseolus aconitifolius*.

Rosenfeld (G.). **Paracoccidioides brasiliensis.**—*Rev. clin. S. Paulo, 1940*, p. 197, 1940. [Portuguese. Abs. in *Bol. Ofic. sanit. panamer.*, xix, 10, p. 1015–1016, 1940.]

The occurrence of *Paracoccidioides brasiliensis* [*R.A.M.*, xx, p. 116]

in the blood stream in cases of ganglionary blastomycosis in Brazil is discussed.

Carrión (A. L.). **The specific fungi of chromoblastomycosis.**—*Puerto Rico J. publ. Hlth*, xv, 4, pp. 340–361, 5 pl., 1940.

This is a comparative study of 28 fungi isolated from cases of chromoblastomycosis [*R.A.M.*, xx, p. 16] in ten countries: five of the organisms are referred on the basis of their mode of sporulation to *Phialophora verrucosa*, 22 to *Fonsecaea pedrosoi* (Brumpt) Negroni, 1936, emend., and one to *F. compactum* Carrión, 1935, comb. nov. [but see ibid., xix, p. 557]. Two varieties of *F. pedrosoi* are described [with Latin diagnoses], namely *F. pedrosoi* var. *cladosporioides* (syn. *Hormodendrum algeriensis* [ibid., vii, p. 639] and *Phialoconidiophora guggenheimia* [ibid., xvii, p. 812]) and *F. pedrosoi* var. *communis*, respectively; the former includes isolates in which the sporulation is mostly of the *Hormodendrum* (*Cladosporium*) type and the latter comprises a large number of intergrading forms in which both the *Hormodendrum* and pseudo-*Acrotheca* types of sporulation are abundantly represented. It has been clearly demonstrated that the existing differences between the agents of chromoblastomycosis reside merely in the proportion, and not in the nature, of the methods of sporulation. *F. pedrosoi typicus* [i.e., typical *F. pedrosoi*] embraces a number of species erroneously described as independent, including *Acrotheca pedrosoi* [ibid., xvi, p. 99], *Trichosporium pedrosoanum*, *Botrytoides monophora* [loc. cit.], and *Hormodendroides pedrosoi* [ibid., xvi, p. 251].

Without questioning the possible existence in chromoblastomycosis of other etiological species in addition to those comprising the three specific groups herein discussed, the author is of the opinion that most of the organisms to be isolated from future cases of the disease will fall into one or the other of these categories.

MacKinnon (J. E.). **Micosis autoctonas en Uruguay.** [Indigenous mycoses in Uruguay.]—*An. Fac. Med. Montevideo*, xxv, p. 53, 1940. [Abs. in *Bol. Ofic sanit. panamer.*, xix, 10, p. 1017, 1940.]

The author presents a bibliography of indigenous Uruguayan mycoses, together with *inter alia*, an analysis of ten cases of favous tinea involving three separate sites and caused by *Achorion milochevitchii* [*R.A.M.*, xvii, p. 38], diagnostic observations on generalized epidermomycosis and onychia associated with *Trichophyton rubrum*, and a report of pityriasis versicolor [*Malassezia furfur*: ibid., xx, p. 117] affecting 0·5 per cent. of the inmates of a skin clinic. The first case of chromoblastomycosis (*Phialophora verrucosa*) [see preceding abstract], and incidentally the first record of the disease in South America, was recorded in Uruguay in 1933 [ibid., xiv, p. 509]. Sporotrichosis [*Sporotrichum* spp.] occurs with relative frequency, 32 cases having been diagnosed.

Joachim (H.) & Polayes (S. H.). **Subacute endocarditis and systemic mycosis (Monilia).**—*J. Amer. med. Ass.*, cxv, 3, pp. 205–208, 7 figs., 1940.

This is a detailed account of a fatal case of subacute endocarditis

and systemic mycosis, attributed to infection by an unidentified species of *Monilia* [*Candida*] in a 48-year-old man at Brooklyn, New York. The fungus, cultured on Sabouraud's medium, consisted of ovoid elements, averaging 4 $\mu$ in diameter, with atypical short mycelia and distinct indications of hyphae in one of the subcultures; reproduction was effected by budding. At 37·5° C. nutrient, dextrose, and blood agar media gave rise to opaque, yellow, convex, round, non-haemolytic colonies after 48 to 72 hours. This is believed to be only the second case of the kind reported in the literature, and in the first (*Arch. Path. Lab. Med.*, xxvii, p. 394, 1939) the causal organism was not isolated or identified.

Negroni (P.) & Tey (J. A.). **Estudio micológico del primer caso argentino de micetoma maduromicósico de granos negros.** [Mycological study of the first Argentine case of maduromycotic mycetoma with black grains.]—*Rev. Inst. bact., B. Aires*, ix, 2, pp. 176–189, 6 figs., 1939. [French and English summaries.]

A description is given of the first case on record in the Argentine of Madura foot, a microscopic examination of the black grains, 3 mm. in diameter, associated with which revealed a septate mycelium, 3 $\mu$ in diameter and chlamydospores, up to 20 $\mu$ in diameter, enclosed in an amorphous, brown, intercellular substance. The fungus was cultured and identified as *Aspergillus chevalieri* [*R.A.M.*, xviii, p. 255].

Minchew (B. H.), Collins (B. E.), & Harris (M. M.). **External ear disease with special reference to the fungous type.**—*Sth. med. J.* (*J. sth. med. Ass.*), xxxiii, 12, pp. 1345–1348, 1940.

Of 93 suspected cases of otomycosis investigated at the Georgia State Health Department in 1939, 27 (30 per cent.) revealed fungal involvement of the ear canal, associated with *Aspergillus flavus* (10), *A. fumigatus* (5), *A. sydowi* (4), *A. niger* (3) [*R.A.M.*, xix, p. 703], *A.* sp. (4), and *Penicillium* sp. (1). The relative absence of organisms of this group from normal ears and from the skin is regarded as suggestive of etiologic significance in troubles of the auditory canal.

Hofbauer (W.). **Die Pilzerkrankungen der Haut.** [Fungous diseases of the skin.]—*Wien. klin. Wschr.*, liii, 14, pp. 280-284, 1940.

This is a useful survey, based on the author's experience at the Vienna University Clinic for Skin Diseases, of the mycological, clinical, diagnostic, and therapeutic aspects of the human skin infections caused by *Microsporon* [*Malassezia*] *furfur*, *Microsporon minutissimum*, *M. audouini*, *M. lanosum*, various forms of epidermophytosis and trichophytosis, including those associated with *Epidermophyton* [*floccosum*], *E.* Kaufmann-Wolf, *Trichophyton gypseum*, *T. rosaceum*, *Achorion schoenleini*, *A. quinckeanum*, and thrush [*Candida albicans*].

Du Bois. **Le traitement des épidermophyties interdigitales.** [The treatment of interdigital epidermophytoses.]—*Schweiz. med. Wschr.*, lxx, 50, pp. 1223–1225, 1940.

This article is mainly concerned with the clinical and therapeutical aspects of interdigital epidermophytoses but contains the information

that the fungi responsible for the condition in Switzerland are *Epidermophyton inguinale* [*E. floccosum*], *E.* [*Trichophyton*] *interdigitale*, and *E.* [*T.*] *rubrum*. Two cases of the last-named predominantly Asiatic species were observed at Geneva, one in a merchant returned from the East [cf. *R.A.M.*, xvi, p. 459].

ROGERS (RUTH E.), HIRSCHMANN (DORIS J.), & HUMFELD (H.). **Comparison of growth of Trichophyton interdigitale on wool fabric with and without additional nutritive media.**—*Proc. Soc. exp. Biol., N.Y.*, xlv, 2, pp. 729–733, 1 fig., 1940.

An isolate of *Trichophyton interdigitale* from the American Type Culture Collection, 1939, was grown at room temperature on Sabouraud's dextrose, peptone, mineral salts, and water agars, with and without the addition of steam-sterilized ½ in. squares of woollen blanket fabric. The fungus developed on the Sabouraud's and peptone media, but not on the other two, except in the presence of wool, growth on which was apparently stimulated by the mineral salts. The dextrose medium was utilized in preference to the wool, which was readily attacked, however, on the peptone agar.

WU (S. D.) & KUROTCHKIN (T.). **A case of fungus infection of the maxilla due to Spondylocladium-like fungus; a hitherto undescribed lesion.**—*Chin. med. J., Suppl.* 3, pp. 195–197, 2 pl., 1940.

From lesions simulating carcinomata in the nose, right maxillary region, and lymph nodes of the neck of a 28-year-old male patient at the Peiping Union Medical College the writers in 1936 isolated a species of *Spondylocladium*, characterized by dark brown, 3- to 5-cellular conidia, 32 to 36 by 8 to 12 $\mu$, borne directly at the ends of long, broad, branching hyphae. Inoculation experiments on laboratory animals gave negative results.

WALDBOTT (G. L.), ASCHER (M. S.), & ACKLEY (ALMA B.). **Fungi: relation to respiratory allergy.**—*J. Mich. med. Soc.*, xxxix, 9, pp. 645–647, 1 graph, 1940.

A survey of the content of the air for fungus spores was conducted over a period of a year (November, 1937, to November, 1938) at Detroit, Michigan, in a number of different habitats, such as roofs of buildings, shops, stables, libraries, and so forth [*R.A.M.*, xx, p. 15]. Among the perennial fungi, *Penicillium*, yeasts, and *Torula* predominated, while *Alternaria* and *Monilia* [? *Candida*], though present throughout the year, showed a seasonal prevalence from July to November and May to November, respectively. The yeasts and *Torula*, which are regarded as clinically significant, reached their maximum incidence between December and March, when relatively few spores of other genera developed. *Aspergillus*, believed by some to be very abundant, gave relatively low counts throughout the period of the survey.

**Indian Central Jute Committee. Annual Report of the Agricultural Research Scheme for the year 1939–40.**—50 pp., 5 pl., 1940.

Section VII of this report (pp. 26–36), dealing with jute diseases in India, contains the following information. About a fortnight after

sowing at Dacca Farm, Bengal, the initial symptoms of stem rot (*Macrophomina phaseoli*) [*R.A.M.*, xii, p. 267] became apparent in the form of typical damping-off in the collar region of the seedlings, as well as in that of blight, originating in the cotyledonary leaves; in some cases infection had penetrated to the root system. The disease spread in patches of continuously increasing size, and by the time the crop was a month old foliar infection was prevalent, this secondary infection originating from pycnospores borne on necrotic or partially recovered seedlings. Brownish patches developed on the stems as a result of contact with the shrivelled, yellow infected leaves, the epidermis peeling off and exposing the fibrous tissue. At this stage the patch might either extend right round the plant, causing complete desiccation (though the stalks remained standing erect), or the advance of the pathogen might be arrested and the host survived. At the age of 11 weeks, roughly 20 per cent. of the *Corchorus capsularis* plants, comprising the D. 154 and 386 and Fanduk varieties, were diseased as against 12 per cent. among those of *C. olitorius* (R. 26, Chinsurah Green, and Dacca Local). The relative resistance of the latter species in the field, however, was not maintained in inoculation experiments in which 22 varieties of both types were exposed to favourable conditions for infection, namely, warmth and humidity (above 80 per cent.), such as occur in the field during the second half of June and cease after the middle of August. *M. phaseoli* was observed to be much more widespread in late sown upland crops than in those sown early in low-lying areas. Two or three timely thinnings were found to be helpful in the control of stem rot, the incidence of which was also reduced by seed treatment with formalin, mercuric chloride, or hot water (56° to 60° C.), the period of immersion in all cases being 20 minutes. Out of 2,140 seeds examined 1,934 (90·33 per cent.) were found to be healthy, 168 (7·9) were light and shrivelled, 11 (0·52) contained hyphal growths, and 27 (1·25) were occupied by sclerotia, which in some instances had caused disintegration of the cotyledons and endosperm. The seeds containing hyphae gave rise to 100 per cent. diseased seedlings, the corresponding number for the light and shrivelled material being 12·1 per cent. Cross-inoculation experiments with the jute strain of *M. phaseoli* and a culture isolated from severely infected cotton plants [see above, p. 162] showed the former to be the more virulent.

At the inception of the flowering stage in early August yellowish to brownish spots developed on the foliage and later spread to the petioles and stems, frequently involving the desiccation of the axillary and apical buds, and sometimes the shrivelling of the whole plant. The pods of mature plants became infected and bore the pycnidia of *Diplodia corchori*, the pathogenicity of which was confirmed by inoculation experiments.

Considerable variation was observed in the symptoms of chlorosis, possibly a virus disease, which may affect only a single branch. Sudden spread and a tendency to recovery from the disorder was noted; thus, at the age of two months, some 48 per cent. of the plants in a stand (all *C. capsularis*) were affected, whereas three weeks later the incidence had fallen to 30 per cent. The use of a nitrogenous (cattle) manure, either singly or in combination with potash or phosphorus,

was observed to increase the prevalence of chlorosis while diminishing that of stem rot, the best results in the control of which was obtained with a combination of nitrogen, potash, and phosphorus fertilizer plus calcium; a mixture of ammonium sulphate and superphosphate was also beneficial.

**The rot-proofing of sandbags.**—*Chem. & Indust.*, lix, 50, p. 831, 1940.

A cheap and simple method of protecting jute and cotton sandbags against rotting by micro-organisms [*R.A.M.*, xix, p. 538] has been developed by Imperial Chemical Industries. The 'one-bath' treatment, which is estimated to increase the service life of the bags at least eight times at a cost not exceeding $\frac{1}{10}d.$ per bag, is carried out as follows. A basic copper carbonate suspension is prepared by the slow stirring of 4½ lb. soda ash or 11½ lb. soda crystals in 5 gals. water into a solution of 10 lb. copper sulphate crystals in 30 gals. water, using a wooden (not iron) vessel; the quantity is then made up to 40 gals., 2 oz. calsolene oil HS (an inexpensive wetting agent) added, and the sandbags immersed until thorough saturation is effected. After the removal of excess liquor by wringing or passage through a hydro extractor, the bags should weigh twice their original weight. They are then dried at a low temperature. The period of immersion in cold water should not be less than five minutes, but the process may be expedited by warming the water to 85° to 100° F. Equally good results were obtained by the use of separate solutions of copper sulphate and soda, and this method may be preferable for compact and tightly woven materials or bags in compressed bales. Samples of treated fabrics buried in garden soil for eight months were found to be in excellent condition at the end of the test, by which time the controls were almost entirely disintegrated. [This information is also presented in *Chem. Tr. J.*, cvii, 2795, p. 336, 1940.]

Dimock (A. W.). **The Rhizoctonia root rot of annual Stocks (Matthiola incana).**—*Phytopathology*, xxxi, 1, pp. 87–91, 2 figs., 1941.

Nursery gardeners in the eastern United States are stated to incur heavy losses through a destructive foot rot of annual stocks (*Matthiola incana* [var. *annua*]) characterized by girdling of the stem at soil-level and complete foliar wilting, up to 50 per cent. failure in the plantings having been observed during the past two years in New York. One or more strains of *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xv, p. 24] were shown by inoculation experiments to be involved in the etiology of the disease. The pathogen gains ingress to the host at or just below soil-level and may extend through the entire root system, plants of any age up to two months being susceptible. The affected tissues turn black and undergo marked constriction. Unilateral development of the plant frequently follows the initial confinement of the lesions to one side of the stem. The fungus was experimentally shown to spread through the soil at the rate of at least 10 in. per month. The strain of *C. solani* isolated from stocks was proved by inoculation tests to be pathogenic to *Alyssum compactum*, *A. maritimum*, and *Iberis umbellata*. Very satisfactory control of the disease in heavily infested soil was

secured by sterilization with steam or chloropicrin (10 c.c. per cu. ft.) [ibid., xix, p. 611].

Mitter (J. H.) & Mitra (A. K.). **Occurrence of Sclerospora graminicola (Sacc.) Schroet. on Setaria verticillata Beauv. in Allahabad.**—*Curr. Sci.*, ix, 10, p. 461, 1940.

*Sclerospora graminicola*, the agent of green ear disease of *Pennisetum typhoides* in India [*R.A.M.*, xi, pp. 507, 634], has been observed in the conidial stage on *Setaria verticillata* growing in a shady position in the Allahabad University Botanical Gardens. This is apparently the first record of the downy mildew on the host in question.

Kadow (K. J.). **A new spray is born.**—*Amer. Fruit Gr.*, lx, 12, pp. 11, 18, 3 figs., 1940.

During 1940, experiments were carried out in five commercial orchards in Delaware to determine the value of a ground spray of elgetol (sodium dinitro-orthocresylate and a mixture of sodium nitrate with calcium arsenite) in the control of apple scab [*Venturia inaequalis*: *R.A.M.*, xix, p. 353]. Spray equipments with pressures ranging from 400 to 600 lb. were used, both guns and six- to eight-nozzle brooms being tested; the latter proved superior in giving a wider sweep to the fungicide. In one block of 15-year-old Red Delicious trees below which 0·5 per cent. elgetol was applied at the rate of 600 lb. per acre just before the breaking of the leaves, infection on 16th May was only just over 2 per cent., although the regular spraying had not been well timed by the grower, whereas in previous seasons the disease had been too severe to admit of control by spraying. Trees receiving only ground sprays of elgetol showed 4 per cent. leaf infection on 16th May and 67 per cent. fruit scab on 29th August, as compared with 58 and 100 per cent., respectively, on the untreated controls, while the percentage of fruit infection on the trees given both ground sprays and the regular sulphur application was only 29.

Wormald (H.). **The grey mould of fruit, and some of its host plants.** *Gdnrs' Chron.*, Ser. 3, cix, 2823, p. 44, 2 figs. (1 on p. 45), 1941.

In the spring of 1940 *Botrytis cinerea* was observed at the East Malling Research Station to be causing an eye rot of half-grown apples still on the tree, similar specimens being sent from Cambridge for examination. The fungus was almost invariably found on the withered calyx lobes, whence it had evidently spread round the eye. Further development, culminating in the complete rotting of the fruits, occurred on a number of such apples transferred to moist chambers. This disease appears to be identical with an eye rot of apples recently described from New Zealand [*R.A.M.*, xix, p. 644]. Strains of *B. cinerea* from seven different hosts were inoculated into apples with positive results.

Plakidas (A. G.). **Infection with pure cultures of Clitocybe tabescens.** —*Phytopathology*, xxxi, 1, pp. 93–95, 1 fig., 1941.

Great difficulty has been experienced in securing the infection of pear and tung [*Aleurites ? fordii*] with *Clitocybe tabescens* [*R.A.M.*, xx, p. 68], the agent of root rot in both these trees in Louisiana. Recently,

however, a very satisfactory method has been devised, similar to that used by H. E. Thomas in his studies on *Armillaria mellea* [ibid., xiii, p. 552], and involving the culture of the fungus on autoclaved thick pieces of either of the two hosts in ½-gal. jars, to which are added a spoonful of maize meal and 250 c.c. water before autoclaving; in four to six weeks the wood becomes permeated by the mycelium and rhizomorphs are produced in abundance. On 17th May, 1938, one out of four eight-year-old Pineapple pears inoculated on 28th September, 1937, was observed to be wilting, and on examination the main roots and the portion of the trunk from the crown to about 12 in. above soil-level were dead. White plaques of rhizomorphs were present between the wood and the bark and between the cortical layers. On 16th April, 1940, one out of six young trees inoculated on 8th February, 1938, was found dying with typical symptoms, a rhizomorphic strand uniting the inoculum with the tap-root at the base of the trunk. Two of the four eight-year-old trees inoculated in September, 1937, were blown down on 29th March, 1940, and their root systems found to be infected, though no external symptoms were apparent. *C. tabescens* was reisolated in all cases from the diseased tissues. This is believed to be the first record of successful infection with pure cultures of the pathogen.

Martin (Ella M.). **The morphology and cytology of Taphrina deformans.**—*Amer. J. Bot.*, xxvii, 9, pp. 743–751, 29 figs., 1940.

A detailed account is given of the writer's studies on *Taphrina deformans* [*R.A.M.*, iv, p. 447], isolated in pure culture from infected Elberta peach trees in various localities in Kansas, Illinois, North Carolina, and Indiana. The binucleate dicaryophase was found to be initiated by a nuclear division in the germinating secondary spore and to continue through the germ-tube, the mycelium, and the ascogenous cells developed from the shorter cells of the subcuticular mycelium, culminating in the fusion of nuclei in each of the last-named. The shorter haploid phase begins with the first division in the ascus and is represented by the eight uninucleate primary ascospores and the secondary spores produced by their budding.

Daines (R. H.). **A new copper spray for Cherry leaf spot control.**—*Hoosier Hort.*, xxii, 7, pp. 105–107, 1940.

The best results in the control of cherry leaf spot [*Coccomyces hiemalis*] with copper fungicides in three years' tests in New Jersey were given by home-made copper phosphate, 2 lb. copper sulphate, 2 lb. trisodium phosphate powder, and 4 lb. hydrated lime being required to make up a solution of 100 gals.; the addition of a spreader, such as orthex, is beneficial. The strong adhesive properties of this mixture, while enhancing its fungicidal efficacy, preclude its use as a pre-harvest spray, for which purpose lime-sulphur is usually adequate: at least two post-harvest applications of copper phosphate should be given, one immediately after the fruit is gathered and the second about three weeks later.

Meredith (C. H.). **The growth of Fusarium oxysporum cubense in the soil.**—*Phytopathology*, xxxi, 1, pp. 91–93, 1941.

The daily average rates of surface spread of *Fusarium oxysporum* var.

*cubense*, the agent of Panama disease of bananas, in a modified greenhouse compost, a mixture of equal parts of coarse river sand and greenhouse compost, and a clay subsoil at the Glenleigh Laboratory, Highgate P.O., Jamaica, were 0·47 cm., 0·36 cm., and 0·3 cm., respectively, over a period of 42 days, the rate of daily spread in different parts of this period ranging from 0·24 cm. to 0·60 cm. The depth of penetration after eight days in thirteen soils varied from 0·3 cm. in a silt loam to 0·52 cm. per day in a coarse sandy loam.

MAGEE (C. J. P.). **Pathological changes in the phloem and neighbouring tissues of the Banana (Musa cavendishii Lamb.) caused by the bunchy-top virus.**—*Sci. Bull. Dep. Agric. N.S.W.* 67, 32 pp., 30 figs., 1940.

Intensive studies at the University of Sydney on Cavendish or Dwarf banana plants suffering from bunchy top [*R.A.M.*, xix, p. 610] showed the most reliable diagnostic symptom to be the characteristic green streaking of the vascular traces in the leaf blades, midribs, and petioles, which is correlated with the partial or total replacement of the normal phloem by a morbid tissue containing obliterated or necrotic areas. The mechanical sheath of the phloem may be lacking or represented only by a few fibres, while the surrounding ground parenchyma is subdivided into a small-celled tissue with a high chloroplast content per given area, which induces the familiar external green streaking.

The foregoing abnormalities arise as a sequel to aberrations in the ontogeny of the phloem and adjacent tissues during the incubation period of the disease, and subsequently with the development of each young leaf, the sieve-tubes apparently providing the channels of ingress for the virus. The primary effect of the infective principle is to induce hypertrophy of the cell volume or the nucleus of any unspecialized cells in proximity to the sieve-tubes, or both, and hyperplasia of the more remote surrounding cells. Since these changes involve the sieve-tube mother cells, young sieve-tubes, companion cells, and phloem parenchyma, very extensive modification of the phloem strands ensues. Moreover, the extension of hypertrophy and hyperplasia to the young mechanical sheath and ground parenchyma entails irregularities in the further development of these tissues. Although the factors underlying these alterations are not fully understood, the possibility is suggested that the virus is a growth-stimulating substance, the relative concentrations of which determine cell response.

The obliteration or necrosis of certain cells may accompany hypertrophy and is followed by the infiltration of mucilage, but phloem necrosis is regarded as of secondary importance in comparison with the other pathological changes discussed. The substitution of a morbid tissue for the phloem is considered to be responsible, by interference with translocation, for the accumulation of starch and crystalline material in the diseased foliage, and ultimately for all the external features of bunchy top.

The histopathology of banana bunchy top is briefly compared with that of potato leaf roll and curly top of sugar beet [ibid., xi, p. 741; xvi, p. 650], and attention drawn to some striking analogies in the activities of the three viruses concerned.

Ruehle (G. D.). **Algal leaf and fruit spot of Guava.**—*Phytopathology*, xxxi, 1, pp. 95–96, 1941.

Guava leaves and fruits in south Florida are stated to suffer heavy damage from infection by *Cephaleuros virescens* [*C. mycoidea*], resulting in partial defoliation and severe blemishing, the large-fruited Peruvian variety being particularly susceptible. The dark greenish-brown to black, slightly raised spots on the fruits are surrounded by irregular, dendritically lobate margins and seldom exceed 2 mm. in diameter; penetration is confined to the first few subepidermal layers. Good control has been obtained by the application, at three- to four-weekly intervals, of 3–3–100 Bordeaux mixture or its fungicidal equivalent in one of the 'neutral' or 'fixed' coppers.

Das Gupta (S. N.) & Verma (G. S.). **Studies in the diseases of Mangifera indica Linn. II. Effect of injecting healthy Mango fruits with extract from naturally occurring necrotic Mangoes.**—*Proc. Indian Acad. Sci.*, Sect. B, xii, 4, pp. 95–108, 1 col. pl., 1 fig., 1940.

Symptoms of necrosis comparable with those occurring under natural conditions in Bihar and the United Provinces were induced in 71 out of 186 (38 per cent.) sound Dasehri and Safeda mango fruits [*R.A.M.*, xviii, p. 329] by the injection through the distal end of the fruits still attached to the tree of extracts (stored or fresh) from diseased tissues, the latter variety being the more susceptible of the two (46·1 as against 20·7 per cent. positive). Control experiments with extracts from healthy mangoes produced necrosis in 4 out of 80 (5 per cent.) Safeda mangoes and 0 out of 10 Dasehri. Most of the affected fruits developed symptoms characteristic of the more advanced (but not the final) stages of the necrosis as observed in the field. Common to both the spontaneous and induced forms of the disease are the scattered grey spots, gradually coalescing into a necrotic area surrounded by an etiolated zone, whereas the water-soaked lesions appearing in response to injection are not typical of the disorder in naturally affected fruits.

Black (L. M.). **Hereditary variation in the ability of the Clover leaf hopper to transmit Potato yellow dwarf virus.**—Abs. in *Phytopathology*, xxxi, 1, p. 3, 1941.

Selective breeding through ten generations resulted in the development of two races of clover leafhoppers (*Aceratagallia sanguinolenta*) one 'active' and the other 'inactive'. Under conditions in which 80 per cent. of the active individuals transmitted the potato yellow dwarf virus (*Marmor vastans*) [*R.A.M.*, xix, p. 724] to crimson clover (*Trifolium incarnatum*), only 2 per cent. of the inactive insects and 30 per cent. of the hybrids between the two races handed on the infective principle. Active individuals appeared in colonies of the inactive race, while conversely, some inactive ones were present among the active. Active insects from an active race were more efficient vectors than those from an inactive (efficiency coefficients 0·53 and 0·68, respectively); while a slightly but significantly higher percentage of males (43 per cent.) than females (38 per cent.) transmitted the virus.

McCallan (S. E. A.) & Setterstrom (C.). **Toxicity of ammonia, chlorine, hydrogen cyanide, hydrogen sulphide, and sulphur dioxide gases. I. General methods and correlations.**—*Contr. Boyce Thompson Inst.*, xi, 5, pp. 325–330, 1 diag., 1940.

McCallan (S. E. A.) & Weedon (F. R.). **Toxicity of ammonia, chlorine, hydrogen cyanide, hydrogen sulphide, and sulphur dioxide gases. II. Fungi and bacteria.**—ibid., xi, 5, pp. 331–342, 1 diag., 11 graphs, 1940.

Full details are given of studies on the relative toxicity of ammonia, chlorine, hydrogen cyanide, hydrogen sulphide, and sulphur dioxide gases commonly occurring in industrial atmospheres to various forms of plant and animal life [*R.A.M.*, xx, p. 128]. Species of pathogenic fungi and bacteria, green leaves and stems, seeds, insects, and rodents were exposed to a continuous flow of gas at controlled concentrations of 1, 4, 16, 63, 250, and 1,000 p.p.m. of air by volume for periods of 1, 4, 15, 60, 240, and 960 minutes. After exposure the presence or absence of growth of the fungi on fresh sterile media was noted. The fungi and bacteria tested were *Sclerotinia fructicola*, *Ceratostomella ulmi*, *Glomerella cingulata*, *Macrosporium* [*Stemphylium*] *sarciniforme*, *Pestalozzia stellata*, *Botrytis* (*cinerea* type), *Rhizoctonia tuliparum*, *Sclerotium delphinii*, *Monilia* [*Candida*] *albicans*, and *Escherichia coli* and comparison of L T 50 values (50 per cent. killed) in minutes at a concentration of 1,000 p.p.m. showed the following order of toxicity of the gases: sulphur dioxide [loc. cit.], chlorine > ammonia > hydrogen sulphide, hydrogen cyanide; to green leaves or stems, chlorine > sulphur dioxide > ammonia, hydrogen cyanide > hydrogen sulphide. The results indicate that, in general, sulphur dioxide and chlorine tend to be the most toxic towards plant life and hydrogen cyanide and hydrogen sulphide the most toxic to animals.

*S. delphinii* and *R. tuliparum* were the most sensitive of the cultures and *Ceratostomella ulmi* and *E. coli* the least. Young cultures were more sensitive than older ones. There was a conspicuous delay in visible growth of viable cultures after transfer to fresh media.

Upholt (W. M.) & Hoskins (W. M.). **Factors concerned in the deposit of sprays. VII. Design and use of a photographic apparatus for studying the impact and movement of individual drops upon a surface.**—*J. econ. Ent.*, xxxiii, 1, pp. 102–107, 2 figs., 3 diags., 1940.

An apparatus is described for taking photographs, with a very brief exposure ($\frac{1}{10000}$ second), of drops of a liquid at any time desired before, during, or after contact with a solid surface, thereby enabling accurate measurements to be made of the advancing and receding angles. The effects of continued spraying may be studied by allowing a given number of drops to strike and move down the surface. The method being relatively cheap, many tests may be made and slight differences in the behaviour of test preparations evaluated with precision.

Miller (F. W.). **Retarding mold in cheese.**—Abs in *Nat. Butt. J.*, xxxi, 8, pp. 12–13, 38, 1940.

Experiments were conducted at the E.I. du Pont de Nemours Company to determine the effects of propionic acid [see above, p. 160] and

sodium and calcium propionates on the growth of [unspecified] moulds on cheese cuts enclosed in cellophane (300 M.S.T.) bags. Half-pound wedge-shaped pieces (six per treatment) were first exposed to air contamination, then immersed in the treating solution, drained, and finally stored at 58° to 60° F. and 90 per cent. relative humidity. Propionic acid was found to be about twice as effective as the salt solutions for the purpose in view. Treatment in 8 per cent. propionic acid for 15 seconds, followed by a draining period of four minutes, produced a delay of 18 to 21 days in mould development.

FOISTER (C. E.). **War on plant diseases.**—*Scot. J. Agric.*, xxiii, 2, pp. 163–168, 1941.

Attention is drawn to the urgent necessity of stringent safeguards against plant diseases, some of which take a heavy annual toll of Scottish crops and so cause a substantial decrease in the production of home-grown foods. To cite some examples, the average yearly losses from potato blight [*Phytophthora infestans*] and virus diseases each amount to 10 per cent. of the crop, the two together depriving the country of some 180,000 tons of potential produce. Effective control measures against the pre-emergence blight and stripe of oats due to *Helminthosporium avenae* are now in force in Scotland, resulting in a crop of 633,000 tons in 1938, but had the disease been allowed to develop unchecked, annual losses of 40,000 to 63,000 tons might have been anticipated [*R.A.M.*, ix, p. 771]. Glasshouse tomatoes are subject to severe damage from disease, more rigorous elimination of which would, in the writer's opinion, increase the output of this crop by 15 per cent. over the 6,000 tons harvested in 1935. Similarly, adequate methods of seed treatment are available, but not yet widely enough employed, against such diseases as black leg of beet and mangold [*Phoma betae*, *Pythium de Baryanum*, *P. aphanidermatum*, and *Corticium solani*] and foot rot and pod canker of peas [*Mycosphaerella pinodes* and *Ascochyta pisi*]; in all probability the treatment of all pea seed by the wholesale merchant would contribute largely to a reduction in the losses from these sources.

WAKSMAN (S. A.). **The microbiology of cellulose decomposition and some economic problems involved.**—*Bot. Rev.*, vi, 12, pp. 637–665, 1940.

Fungi are concerned in a number of economic and industrial problems involving the decomposition of cellulose, e.g., the destruction of timber and its manufactured products, the disorganization of healthy plant tissues, and the preparation of soil and composts. The literature on these and cognate aspects of cellulose microbiology is summarized and briefly discussed in the light of recent critical studies by the author and others: much of it has already been noticed at the time of publication in this *Review*.

FAWCETT (H. S.). **Suggestions on plant virus nomenclature as exemplified by names for Citrus viruses.**—*Science*, N.S., xcii, 2398, pp. 559–561, 1940.

Proposals are submitted for plant virus nomenclature according to a system combining the best features of those of Johnson, Smith, and

Holmes without their numerical and generic complications [cf. *R.A.M.*, xx, p. 85]. The principle involved in the formation of a generic name consists in the addition of the stem 'vir' for virus (Latin neuter) to the Latin genitive of the host genus in which the virus was first detected and recognized, dropping any final consonants: to cite some illustrations, peach rosette, raspberry streak, beet curly top, and potato yellow dwarf would become, respectively, *Prunivir rosettae*, *Rubivir orientale*, *Betaevir eutetticola*, and *Solanivir vastans*. Since the virus names are predetermined by the name of the host and since they carry their own meaning authors need only be cited for the species name. New combinations would consequently be unnecessary. A further suggestion is that no suspected virus be given a binomial name merely from the observation of certain symptoms indicative of this type of infection until conclusive proof is forthcoming of its transmissibility from plant to plant by budding, grafting, insect vectors, or mechanical means. Varietal names, when applied, should follow established botanical procedure, but in no case should they be based merely on slight fluctuations in behaviour in relation to the host. Following up this line of thought the writer proposes for the citrus viruses causing infectious mottling, psorosis, psorosis A, and psorosis B [ibid., xviii, p. 100] the designations *Citrivir italicum*, *C. psorosis*, *C. psorosis* var. *vulgare*, and *C. psorosis* var. *anulatum*, respectively.

Le Clerg (E. L.). **Pathogenicity studies with isolates of Rhizoctonia solani obtained from Potato and Sugar Beet.**—*Phytopathology*, xxxi, 1, pp. 49–61, 2 figs., 1941.

None of the 89 isolates of *Rhizoctonia* [*Corticium*] *solani* from lesions on the underground stems of older potato plants or from sclerotia on the tubers in widely separated areas of the United States proved to be pathogenic to sugar beet roots [*R.A.M.*, xix, p. 59]. On the other hand, strains of the fungus from beet were, in general, more actively injurious to potatoes than were the isolates from the latter host. Of 97 isolates from spring infections of potato stolons, however, some 25 per cent. were more or less pathogenic to beets, while potato plants from a field previously occupied by severely diseased beets yielded two strains causing 83·3 and 100 per cent. decay, respectively, in inoculated sugar beet roots.

Field surveys of sugar beet and potato fields in Colorado, Wyoming, and Nebraska in 1936, 1937, and 1938 showed that sugar beets following potatoes were usually comparatively free from root rot, whereas those succeeding beets were extensively decayed. Thus, of the 50 fields in which beets were preceded by potatoes, 82 per cent. showed less than 5 per cent. infection, and 60 per cent. only a trace or more, whereas only 39 per cent. of the 28 fields of beets following beets developed 5 per cent. or less root rot. These observations are regarded as pointing to the desirability of a potato-sugar beet sequence rather than the reverse order of rotation.

McKay (R.). **An unusual spotting of Potato tubers and its cause.**—*J. Dep. Agric. Éire*, xxxvii, 1, pp. 93–95, 6 figs., 1940.

Numerous sunken spots, small but variable in size, were observed

on stored potato tubers of the variety British Queen. The spots occurred round the lenticels all over the tuber or only on one side, and penetrated into the flesh to a depth of 1 to 4 mm. No parasitic organism was associated with this spotting, but it was experimentally shown, on British Queen, Duke of York, and Up-to-Date potatoes, to be due to the action of rat excrement, mainly the urine. Usually, two or three applications of a mixture of rat urine and faeces given at intervals of 48 hours were required for the production of symptoms which generally appeared six or seven days after the first application. That the damage was caused by the liquid, rather than by gases from decomposing excrement, was shown by suspending dry tubers over the mixture in a closed vessel, in which case no lesions developed.

In the course of these experiments a small number of tubers developed spotting indistinguishable from pit rot described by G. H. Pethybridge (*J. Dep. Agric. Ire.*, xix, pp. 271–292, 1918–9), and it is suggested that pit rot may be due to the absorption by the tubers of some toxic liquid in the pit.

STARR (G. H.). **Experimental work for the control of ring rot of Potatoes.** —*Amer. Potato J.*, xvii, 12, pp. 318–322, 1940.

A tabulated account is given of the experiments carried out at the Wyoming Agricultural Experiment Station on various aspects of the control of potato ring rot [*Bacterium sepedonicum*: *R.A.M.*, xx, p. 32]. Of a number of five-second dips tested for the disinfection of the cutting knife, mercuric chloride (1 in 500) proved to be the most effective, almost completely preventing the spread of infection from diseased to sound tuber halves by this means. Mercurnol, a commercial acid mercury preparation came next in order of efficacy, reducing the incidence of ring rot from 97·7 to 5 per cent. Little difference was noted between the amount of infection in lots planted soon after cutting on 1st June and in those allowed to heal over for two days.

In a test on the effect of treating infected Bliss Triumph seed before and after cutting, mercurnol (ten minutes) gave the highest yield and also the best control of ring rot (a reduction of infection from 82·4 to 35·8 per cent.) when applied before cutting.

When 85 whole tubers and the same number of cut seed pieces from an infected lot were planted, the former produced 23 per cent. diseased plants and the latter 72 per cent.

From 115 apparently healthy tubers, slightly over 30 per cent. infected plants developed, the corresponding incidence among the stand produced by 67 tubers showing mild symptoms being 85 per cent.

A cutting knife was drawn through a badly infected tuber and then used to cut ten healthy ones, one half of each of which was planted immediately and the other left to heal over for two days, the procedure being repeated five times with 10-tuber lots. Infection developed from nearly all the tubers, being as prevalent in the hill from the tenth tuber as in any of the others.

The inoculation of ten tubers on the sound skin between two eyes failed to induce the disease in the resulting plants, suggesting that the eyes may serve as channels of invasion for the bacterium.

WAKSMAN (S. A.). **Antagonistic interrelationships among micro-organisms.**—*Chron. bot.*, vi, 7, pp. 145–148, 1940.

In this paper (based on an address delivered to the New Jersey Section of the American Chemical Society on 18th November, 1940) the author succinctly reviews and discusses the history of investigations into antagonism among spore- and non-spore-forming bacteria, Actinomycetes, and fungi, with special reference to the control of disease.

WAKSMAN (S. A.) & WOODRUFF (H. B.). **Survival of bacteria added to soil and the resultant modification of soil population.**—*Soil Sci.*, l, 6, pp. 421–427, 1940.

In further experiments at the New Jersey Agricultural Experiment Station on the survival of micro-organisms introduced into the soil [*R.A.M.*, xix, p. 431], fungi proved resistant to the action of (*a*) filtrates of two soil bacteria antagonistic to *Aerobacter aerogenes* and other introduced bacteria, and (*b*) a purified active substance, exerting bacteriostatic effects, isolated from a soil *Actinomyces* and designated actinomycin.

CHESTERS (C. G. C.) **A method of isolating soil fungi.**—*Trans. Brit. mycol. Soc.*, xxiv, 3–4, pp. 352–355, 1 diag., 1940 [issued 1941].

Details are given of a method for the isolation of soil fungi by means of immersion tubes filled with sterile agar or solid plant tissue, thereby obtaining the organisms under the actual conditions of moisture and temperature prevailing *in situ*. Experiments are in progress with three types of tubes viz., direct contact, capillary type, and a special pattern devised for the isolation of Phycomycetes. The tubes have varying numbers of small holes (according to the purpose for which they are designed), either flush with the wall or extending inwards as capillaries; they are sterilized in an autoclave and filled, while enclosed in a container tube, with almost cool nutrient agar to just above the highest capillary, pushed into the soil to the required depth, left to incubate for seven to ten days, and then removed to the laboratory in fresh sterile containers for the subculturing of the colonies developing opposite the capillaries.

CHRISTENBERRY (G. A.). **A taxonomic study of the Mucorales in the Southeastern United States.**—*J. Elisha Mitchell sci. Soc.*, lvi, 2, pp. 333–366, 19 pl., 1940.

Most of the 403 collections of soil and dung on which the present study is based were made in North Carolina, but a few specimens from South Carolina, West Virginia, and four other States were included. Fifty-three species belonging to 18 genera were identified in pure culture on Blakeslee's No. 230 agar, 16, including two new [unnamed] species of *Mucor* (Nos. 1 and 2) being new to the United States. A new variety, *albus* [without a Latin diagnosis], of *Zygorrhynchus vuillemini* [*R.A.M.*, xviii, p. 137] was isolated from pine straw. Keys are supplied for the identification of genera and species.

EDGERTON (C. W.) & FORBES (I. L.). **Hot water treatment of seed Cane.**—*Sug. Bull., N.O.*, xviii, 18, pp. 4–5, 1940. [Abs. in *Facts ab. Sug.*, xxxvi, 1, p. 32, 1941.]

The best results in the control of chlorotic streak of sugar-cane at the Louisiana Agricultural Experiment Station [*R.A.M.*, xix, p. 729] by the hot water treatment of the seed pieces were obtained when the temperature was not allowed to exceed 52° C., the Co. 281 and 290 varieties being particularly subject to heat injury. Untreated cane is liable to germinate very poorly and the young shoots often fail to develop satisfactorily. On the other hand, the hot water treatment cannot be absolutely relied upon to produce better stands, its effects being apparently dependent on weather conditions during the following winter.

McMARTIN (A.). **Eye spot and brown stripe. A report on diseased Sugarcane leaves from Sena Sugar Estates.** *S. Afr. Sug. J.*, xxiv, 12, p. 653, 1940.

At the Mount Edgecombe Experiment Station, Natal, the writer examined specimens of sugar-cane leaves showing symptoms highly indicative of brown stripe (*Cochliobolus stenospilus*, the ascigerous stage of *Helminthosporium stenospilum*) [*R.A.M.*, xix, p. 432], the absence of 'runners' (long, pale strips, eventually turning red, at the end of the halo surrounding the stripes), the narrower halo, and the numbers of lesions with blunt instead of pointed ends suggesting this disease rather than eye spot (*H. sacchari*) [ibid., xx, p. 134], though both are present in a mild form in Natal, and the latter may have been involved. Unless the infection assumes a very severe character, a better crop may probably be cut from Co. 281 than from a variety more resistant to the disease but perhaps less satisfactory in other respects.

BULLER (A. H. R.). **The flexuous hyphae of Puccinia graminis and other Uredinales.**—Abs. in *Phytopathology*, xxxi, 1, p. 4, 1941.

Craigie's data in regard to fusion between pycnospores of opposite sex and flexuous hyphae in *Puccinia helianthi* [*R.A.M.*, xii, p. 318] were confirmed by the author, not only in the sunflower rust but also in *P. graminis* [ibid., xvii, p. 163], *P. coronata*, and *Gymnosporangium clavipes*. Flexuous hyphae have been seen by the author in 30 species of eight genera of the Uredinales. In *Puccinia*, *Uromyces*, and *Gymnosporangium* they are accompanied by many straight or slightly bent, slenderly conical, pointed periphyses, which are absent, however, from the flexuous hyphae of *Phragmidium*, *Gymnoconia*, *Cronartium*, *Melampsora*, and *Melampsorella* [ibid., xix, p. 559].

WAKEFIELD (E[LSIE] M.). **Nomina generica conservanda. Contributions from the Nomenclature Committee of the British Mycological Society. III.**—*Trans. Brit. mycol. Soc.*, xxiv, 3–4, pp. 282–293, 1940 [issued 1941].

The arguments for and against the conservation of twelve further generic names of fungi [*R.A.M.*, xix, p. 118], together with the recommendations of the Nomenclature Committee of the British Mycological Society, are presented, the genera dealt with including *Cordyceps*

(Fr.) Link; *Daldinia* Ces. & de Not. (1863) versus *Perisp(h)aeria* Rouss. (1806), *Perispherostoma* Gray (1821), and *Hemisphaeria* Klotzsch (1843); *Hypospila* Fr. (1825), *Hypospila* Karst. (1873), and *Phoma* Fr. (1823); *Teichospora* Fuckel (1869), *Strickeria* Körber (1865), and *Sphaeria* Fries (1823); *Dothidella* Speg. (1880) and *Plowrightia* Sacc. (1883); *Agaricus* Linn. ex Fr. (1821) versus *Psalliota* (Fr.) Quél. (1872), and *Pratella* (Pers.) S. F. Gray emend. Gill. (1874); *Septoria* Sacc. (1884) versus *Septoria* Fr. (1828); and *Ramularia* Sacc. (1880) versus *Ramularia* (Ung.) Corda (1842).

Sampson (Kathleen). **List of British Ustilaginales.**—*Trans. Brit. mycol. Soc.*, xxiv, 3–4, pp. 294–311, 1940 [issued 1941].

This is the second of the lists of British fungi to be completed in conformity with the recommendations of the Plant Pathology Committee of the British Mycological Society [cf. *R.A.M.*, xx, p. 35]. Plowright's monograph (1889) remains the standard work on the British Ustilaginales, few taxonomic studies on which have been carried out during the present century. The hosts cited by Massee in his 'Mildews, Rusts and Smuts' (1913), based on Plowright's work, are not all derived from British records. The 70 names included in the present list are arranged alphabetically under the three families, Ustilaginaceae, Tilletiaceae, and Graphiolaceae. The prevailing tendency as regards the classification of physiologic races in the Ustilaginales has been to accord them specific rank, a procedure tending to aid diagnosis up to a point; however, the results of more intensive studies, so far limited to a few species, indicate that both host and pathogen comprise a complex network of biotypes, and that the limits set by the classificatory units of higher plants are not strictly followed by the fungus. The author is of opinion that the provision of each such race with a binomial and an authority merely serves to obscure genetic relationships without elucidating the species concept.

Mundkur (B. B.). **A second contribution towards a knowledge of Indian Ustilaginales. Fragments XXVI–L.**—*Trans. Brit. mycol. Soc.*, xxiv, 3–4, pp. 312–336, 1940 [issued 1941].

In this further contribution towards a knowledge of the Indian Ustilaginales [*R.A.M.*, xviii, p. 627], which includes six new species [with Latin diagnoses], the writer transfers *Tilletia indica* [ibid., x, p. 780] to *Neovossia* by reason of its unbranched, rather long promycelia, each with a whorl of non-fusing primary conidia (Buller's primary sterigmata), 32 to 128 $\mu$ or more, at the apex. Moreover, *N. indica* differs from *T. foetens* and *T. caries* in destroying only part of the kernels and not the whole grain, and from *T. triticina* Ranojević and *T. controversa* Kühn in spore dimensions and mode of germination.

*T. panici* n.sp. was collected in 1928 on a species of *Panicum* at Calcutta, and *Ustilago lachrymae-jobi* n.sp. on *Coix lachryma-jobi* on the Girnar Hills, Junagadh, in 1913.

Butler and Bisby's observation [ibid., xi, p. 545] that the form of *Tolyposporium penicillariae* occurring on *Pennisetum typhoides* [ibid., x, p. 625] at Poona does not conform to Brefeld's description (Untersuchungen Gesammtgebiete Mykologie, xii, pp. 99–236, 1895), is

applicable only to the smut from this particular locality, which was found to agree more closely with *T. senegalense* Speg. and is accordingly referred to this species.

*Entyloma fuscum* was collected on *Papaver rhoeas* [*R.A.M.*, xvii, p. 15] at Lahore in 1939, and *E. dahliae* [ibid., xvii, p. 294] on *Dahlia coccinea* in Bombay in 1936.

CORNER (E. H. J.). **Note : larger fungi in the tropics.**—*Trans. Brit. mycol. Soc.*, xxiv, 3–4, p. 357, 1940 [issued 1941].

Applying his Malayan observations to tropical Asia and Australasia as a whole, the author states that the larger fungi would appear to abound in these regions numerically, generically, and specifically, but their seasonal fructifications develop and rot so quickly during the first rains after a dry spell that all trace of them is apt to vanish if the forest cannot be daily visited during the critical fortnight for collection.

VALLEAU (W. D.). **A comparison of the viruses of streak of Tobacco and yellow dwarf of Potato.** Abs. in *J. Bact.*, xl, 6, p. 869, 1940.

A comparative study at the Kentucky Agricultural Experiment Station of the host range and physical characters of the tobacco streak and potato yellow dwarf viruses [*R.A.M.*, xix, p. 724] indicates that they are similar, and possibly merely strains of one virus. Tomato and potato, previously believed to be immune, were found to be hosts of tobacco streak. Potato yellow dwarf is known to affect red clover [*Trifolium pratense*], and circumstantial evidence denotes that the streak virus is transmissible from sweet clover [*Melilotus alba*] to tobacco [ibid., xix, p. 567]. The symptoms of the two viruses are not identical either in tobacco or *Nicotiana rustica*: in the former yellow dwarf causes vein-clearing and no streak. Tobacco with systemic yellow dwarf developed a combination of symptoms on inoculation by grafting with the streak virus, but the fact that the former confers no protection against the latter does not necessarily point to a difference in identity, since the same virus may comprise both necrotic and non-necrotic strains.

PARK (M.) & FERNANDO (M.). **Recent research in Ceylon on the frog-eye disease of cigarette Tobacco.**—*Trop. Agriculturist*, xcv, 3, pp. 131–135, 1940.

This is a summary of the researches carried out at the Wariyapola and Ganewatta Experiment Stations, Ceylon, from 1936 to 1939, inclusive, on the control of tobacco frog eye (*Cercospora nicotianae*) [*R.A.M.*, xviii, p. 420; xx, p. 36], the results of which were severally noticed at the time of their publication.

HOPKINS (J. C. F.). **Field spraying of Tobacco. Reports from demonstration plots.**—*Rhod. agric. J.*, xxxviii [xxxvii], 12, pp. 702–705, 1940.

Successful control of tobacco wildfire [*Bacterium tabacum*], angular leaf spot [*Bact. angulatum*], frog eye [*Cercospora nicotianae*], and (to some extent) of *Alternaria* [*longipes*] by copper sprays having been verified by close observations over areas of 20 to 80 acres in Southern Rhodesia from 1936 to 1939, inclusive, ten demonstration plots, each

10 acres in extent, throughout the tobacco-growing areas were treated under the direction of the Department of Agriculture. The reports received from the various growers undertaking the operations were almost uniformly favourable. Reckoning 10 to 15 gals. per acre per application, three treatments of 10 acres would involve a total consumption of fungicide of 300 to 450 gals., amounting to a cost of between 18*s.* 7½*d.* and £3. 6*s.* 1*d.*, according to the preparation chosen.

Diachun (S.) & Valleau (W. D.). **Conidial production in culture by Cercospora nicotianae.**—*Phytopathology*, xxxi, 1, pp. 97–98, 1941.

Abundant conidial production by *Cercospora nicotianae*, the agent of frog eye of tobacco in Kentucky, was obtained on a medium made as follows: 600 gm. yellow and green leaves from the lower quarters of Burley plants were ground, placed in 2 l. distilled water, and steamed for one hour, 60 gm. agar dissolved in 1 l. water added, the mixture being strained through cheesecloth and a cotton pad, and then autoclaved. Inoculum from potato dextrose agar slants was stirred into the tobacco agar and the plates were incubated at 27° C. in a dark chamber. On 6th May, 1940, five days after inoculation, 26 out of 27 isolates were producing conidia, and further successful results were obtained in later experiments. The conidia formed in culture resembled in shape and size those occurring on frog eye spots in the field, but the conidiophores were longer and straighter, with more widely separated geniculations. Typical frog eye lesions developed on leaves atomized with spores from tobacco agar cultures.

Wilson (J. D.). **Spraying versus dusting of canning Tomatoes with early and delayed applications.**—*Bi-m. Bull. Ohio agric. Exp. Sta.*, xxv, 204, pp. 76–84, 1940.

Comparative tests of Bordeaux mixture (4–4–50), copper lime dust (20–80), copper compound A (Graselli Chemical Co., Cleveland, Ohio: 2½–4–50), the same in dust form plus flour and talc (13–20–67), copper oxychloride sulphate (Harshaw Chemical Co., Cleveland: 2–4–50), the same as a dust plus flour and talc (12–20–68), copper hydro 40 (4–4–50), the same in dust form plus flour and talc (24–20–56), tribasic copper (2–4–50), the same as a dust plus flour and talc (12–20–68), cuprocide 54 (2–4–50), and cuprocide G.A. (7–20–73) for the control of tomato leaf spot (*Septoria* [*lycopersici*]) at Wooster, Ohio [*R.A.M.*, xx, p. 2] are described. The results showed dusting to be superior to spraying for this purpose when five applications were given at 10-day intervals, from 10th July to 21st August, the average yield per acre thus obtained at the first picking on 25th September being 19·8 tons as compared with 18·3, 18·2, and 17·8 for the delayed dust (from 1st to 21st August), early spray, and delayed spray schedules, respectively. No one of the copper-containing materials tested gave significantly better results than another when average yields of all four treatments were considered. The average increase of yield resulting from five treatments (spray or dust) over the controls was 3·4 tons per acre, equivalent to a net return of some $30 per acre. Compound A gave particularly good results in the delayed dusting schedule; both this preparation and Bordeaux mixture exert a retarding effect on ripening, the yield secured at the

late picking on 5th October from plots treated with compound A amounting to 4·1 tons per acre, the maximum obtained at this stage and representing an increase of 2·24 tons over the controls.

Brown (W.). **Damping-off disease of Tomatoes.**—*Gdnrs' Chron.*, Ser. 3, cix, 2824, p. 55, 1941.

The writer briefly describes the excellent results obtained at the Biological Field Station, Slough, in the control of damping-off of tomatoes (*Phytophthora* sp.) in heavily infested soil by a modification of the method of Alexander *et al.* [*R.A.M.*, xi, p. 408], consisting in the incorporation of a mixture of 15 parts formalin and 85 parts of sawdust, charcoal, or air-dried soil, at the rate of 4 to 5 parts per 1,000 of soil. In one test the emergence of the treated and control series amounted to 89 and 17 per cent., respectively.

Hill (A. V.). **Host range and distribution of Tomato big bud.**—*J. Aust. Inst. agric. Sci.*, vi, 4, pp. 199–200, 3 figs., 1940.

During the three seasons 1938 to 1940, big bud of tomato [*R.A.M.*, xix, p. 388; xx, p. 93] was observed on *Solanum nigrum* and *Datura stramonium* in several districts of New South Wales and Victoria. In addition, big bud symptoms were observed on eggplant and were similar to those obtained by grafting infected tomato scions on healthy eggplant. Big bud symptoms also occurred on non-Solanaceous plants, indicating a wide host range of the virus. Field observations suggest that an active insect, such as a jassid, is probably the vector. It is considered likely that the disease known as 'big bud' in Australia, 'stolbur' and 'montar' of tobacco, tomato, and chilli in the U.S.S.R. [ibid., xviii, p. 699], and 'little leaf' of eggplant in South India [ibid., xix, pp. 61, 259] are all due to the same virus or to very closely related viruses.

Endrinal (D. M.) & Celino (M. S.). **Septoria leaf spot of Tomato.**—*Philipp. Agric.*, xxix, 7, pp. 593–610, 3 figs., 1940.

A full description is given of the leaf spot of tomato caused by a fungus considered to be similar to, if not identical with *Septoria lycopersici*, observed for the first time in the Philippines in October, 1939. The fungus was isolated from the greyish to brownish spots, 2 to 3 mm. in diameter, and grown on a number of standard media, of which potato dextrose agar proved to be the most suitable, followed by oatmeal and tomato decoction agars. The optimum hydrogen-ion concentration for the development of the pathogen at 19° to 20° C. was found to lie between $P_H$ 5·6 and 8·4. Inoculation experiments with spore suspensions of *S. lycopersici* on five foreign [American] tomato varieties, True Giant Ponderosa, Dwarf Giant, Sunnybrook Earliana, Marglobe, and Matchless, and two native sorts, Pear and Cherry, gave positive results. Of four other Solanaceae tested for their reaction to the fungus, namely, eggplant, potato, [chilli] pepper, and tobacco, only the two first-named developed small, black foliar spots, which practically disappeared on the removal of the plants from the inoculation chamber, suggesting that in nature infection would probably not occur except under very humid conditions. A number of plants belonging to other families were inoculated without success.

The causal organism of the leaf spot was shown to penetrate the host through the stomata, and to persist from one season to the next in the form of spores and mycelium on diseased plant material. The spores may be carried on the seeds of infected plants and are also disseminated by wind and rain, while experimental evidence further denotes that infection may spread through the soil, and also that adults of *Epilachna vigintioctopunctata* may be instrumental in transmitting the spores from plant to plant. The spores were found to remain viable for six months on dried infected leaves. In addition to the usual sanitary measures, the writers recommend sterilization of the seeds by one minute's immersion in mercuric chloride, followed by rinsing in sterile water before planting.

**Chestnut blight sweeps clean.**—*J. For.*, xxxviii, 12, p. 970, 1940.

Chestnut blight (*Endothia parasitica*), first observed in Bronx Park, New York City, in 1904, has spread over practically the entire eastern range of its host. According to a recent statement by G. F. Gravatt and M. E. Fowler, of the Bureau of Plant Industry, there is not a single large original tree undamaged among uncounted millions, alleged instances of survival being merely temporary escapes from infection among stump and root sprouts or seedlings, and in no way representative of true resistance. After 25 years of record-keeping, the Bureau has not found one tree that can be regarded as truly immune, but some hope for the future growth of forest chestnuts lies in the work of hybridization between American and the resistant Asiatic types [*R.A.M.*, xx, p. 140].

Carter (J. C.). **Diseases of ornamental Oaks in Illinois.**—*Arborist's News* (*Nat. Shade Tree Conf.*), iv, 12, pp. 89–92, 2 figs., 1939. [Received November, 1940.]

Semi-popular notes are given on the diseases of ornamental oaks (including *Quercus macrocarpa*, *Q. palustris*, *Q. borealis-maxima*, *Q. coccinea*, *Q. rubra*, and *Q. alba*) in Illinois, of which anthracnose (*Gnomonia veneta*) [*R.A.M.*, xviii, p. 354] is stated to be the most prevalent and destructive on the foliage. The disease attacks chiefly *Q. alba*, producing a leaf spot and scorch followed by defoliation, which may be complete in cool, wet springs. The fungus also induces twig cankers, which may serve to carry the fungus from one season to the next. Defoliation over a number of years causes die-back of the twigs and general debility, leading to various branch diseases. Of these twig blight, most in evidence on *Q. borealis-maxima*, is associated principally with a species of *Dothiorella*, while several organisms, viz., *Dothiorella*, *Coryneum*, *Cytospora*, *Phoma*, *Nummularia*, and *Diatrype* spp., may be involved in the production of branch cankers, the two first-named being responsible in over 50 per cent. of the cases studied and also commonly involved in the causation of die-back. Smooth patch of white oak (*Aleurodiscus oakesii*) [ibid., xii, p. 601] causes a sloughing-off of the more or less extensive areas of the outer bark, producing unsightly patches without, however, retarding the growth of the tree. *Armillaria mellea* causes heavy damage in neglected plantings, but recent trials have shown that its ravages can be largely counteracted by due attention

to nutritional factors and pruning. Heart rots of various types due to *Polyporus*, *Fomes*, and *Fistulina* [*hepatica*; ibid., xx, p. 140] are stated to cause relatively little injury.

Campbell (W. A.) & Davidson (R. W.). **Top rot in glaze-damaged Black Cherry and Sugar Maple on the Allegheny Plateau.**—*J. For.*, xxxviii, 12, pp. 963–965, 1 fig., 1 graph, 1940.

The glaze storm of March, 1936, caused extensive damage to second-growth hardwoods in the Kane Experimental Forest and elsewhere in northern Pennsylvania and southern New York. Nineteen months after the event B. Sleeth examined a limited number of top wounds in living black cherry (*Prunus serotina*) trees (the most severely injured), and found that white decay (mainly *Polyporus* [*Polystictus*] *versicolor* and *Stereum rameale*) had progressed from 3 to 24 in. (average 14 in.) downwards below the breaks (*Tech. Note Allegheny For. Exp. Sta.* 20, 1938). In August, 1939, the writers examined 191 top wounds in 66 40- to 50-year-old black cherries, and eight months later 94 in sugar maple (*Acer saccharum*) of the same age. The downward extent of visible decay in black cherry averaged 23·5 in. for all breaks (1·5 to 5·5 in.) in diameter. *P. versicolor* and *S. rameale* were again the principal fungi isolated from 82 per cent. of the 152 black cherry samples, being responsible severally for 59 and 20 per cent. of the rot and jointly for 10 per cent., while *P. pergamenus* and unidentified organisms were implicated in 0·7 and 9 per cent., respectively, of the decayed areas. In sugar maple the decay from top breaks under 5 in. in diameter was restricted to 6 in. or less from the wound, and was concentrated chiefly in the oldest wood at the centre. Nine of the 31 wounds from which isolations were attempted yielded *P. versicolor*, 3 *Polyporus hirsutus*, 3 *Hypoxylon* sp., and 4 unidentified wood-rotting fungi.

Davidson (R. W.), Campbell (W. A.), & Lorenz (R. C.). **Association of Stereum murrayi with heart rot and cankers of living hardwoods.** —*Phytopathology*, xxxi, 1, pp. 82–87, 1 fig., 1941.

Isolations on a tannic acid medium [*R.A.M.*, xviii, p. 360] from decay in living yellow and paper birches (*Betula lutea* and *B. papyrifera*), the former in Wisconsin and Michigan and the latter in Minnesota, occasionally revealed the presence of *Stereum murrayi* [ibid., xvi, p. 505] in the heartwood. The fungus was further obtained from cankers on yellow birch and sugar maple (*Acer saccharum*) and from incipient rot in red maple (*A. rubrum*), while sporophores were observed in association with trunk cankers and heart rot of ironwood (*Ostrya virginiana*), beech (*Fagus grandifolia*), and striped maple (*A. pennsylvanicum*). Characteristics of the organism in pure culture included slow growth, a dense, white to cream-coloured, velvety or short cottony, adpressed, mycelium, a distinctive odour of vanilla [ibid., xix, p. 54], and a russet vinaceous to fawn coloration of the submerged agar. The optimum temperature for growth appeared to be about 25° C. and the upper limit 30°. Entry into the host is believed to be effected through dead branch stubs or basal or upper trunk injuries. The economic importance of *S. murrayi* has not yet been ascertained but it has been

occasionally isolated from merchantable yellow birch in the Lake States.

BANFIELD (W. M.). **Relation of vessel length at infection points to extent of vascular invasion in American Elm by Ceratostomella ulmi.**—Abs. in *Phytopathology*, xxxi, 1, p. 2, 1941.

In inoculation experiments with *Ceratostomella ulmi* on American elms [*Ulmus americana*], carried out one hour before felling during June, the extent of vascular invasion [*R.A.M.*, xvi, p. 505] was found to be largely conditioned by the length of the vessels at the site of injection. Vessels found in new shoots were only a few centimetres long, whereas those in the bole frequently measured several metres. Spores introduced 1 to 4 in. from the apex of new shoots had induced no pathological symptoms by the end of the season; at the end of two years the average depth of penetration by the fungus was 8·7 in. Injections in the centre of one-year leaders or in crotches formed at their apices induced widespread vascular invasion in 6 per cent. of 323 experiments, the corresponding percentage for 347 in two-year-old stems being 20. All injections through the bole resulted in extensive vascular diffusion of the fungus. Invasion was limited to several feet in trees 60 ft. high, girdled every 5 ft., injected at stump height in June, and left standing all the season.

MCKENZIE (M. A.) & JOHNSON (E. M.). **Cephalosporium Elm wilt in Massachusetts.**—*Bull. Mass. agric. Exp. Sta.* 368, 24 pp., 12 figs., 1939. [Abs. in *Exp. Sta. Rec.*, lxxxiii, 6, p. 790, 1940.]

The spores of the *Cephalosporium* stage of the fungus [*Dothiorella ulmi*] responsible for an elm wilt simulating that due to *Ceratostomella ulmi* in Massachusetts [*R.A.M.*, xx, p. 140] were found to germinate best on potato dextrose agar, in darkness, and in a moist atmosphere. Most of the information presented here has already been noticed from other sources, but it is of interest to note that the thermal death point of the pathogen lies between 75° and 80° C., and that the viability of the spores is not impaired by freezing. Inoculation experiments on wounded leaves of *Ulmus americana* and its var. *ascendens*, *U. campestris*, *U. glabra* var. *fastigiata*, *U. parvifolia*, and *U. pumila*, were successful in all cases, while infections through injured twigs were also positive on all the species except *U. glabra* var. *fastigiata*. These results denote that in nature, comparable fresh injuries by insects might easily serve as infection courts. Discrepancies between the authors' New England data and those obtained in Nebraska suggest the possible involvement of more than one strain of the fungus. Control measures should be directed towards the maintenance of vigour in the infected trees, particularly by the careful excision and burning of diseased tissues and appropriate treatment of fresh wounds or scars.

WOLF (F. A.) & BARBOUR (W. J.). **Brown-spot needle disease of Pines.**—*Phytopathology*, xxxi, 1, pp. 61–74, 3 figs., 1941.

A full description [with a revised Latin diagnosis] is given of the causal organism of the destructive brown spot needle disease of pines, especially longleaf (*Pinus palustris*) in North Carolina and elsewhere

within the host ranges, viz., *Systremma acicola* (Dearn.) comb. nov., synonyms of which include *Scirrhia acicola* (Dearn.) Siggers [*R.A.M.*, xix, p. 248], *Septoria acicola* (Thüm.) Sacc., and *Oligostroma* (*Phyllachora*) *acicola* Dearn. [ibid., vi, p. 126]. The genetic connexion between the perfect and conidial stages, the latter identified by H. Sydow and F. Petrak as *Lecanosticta acicola* (Thüm.) Sacc. (*Ann. mycol., Berl.*, xxii, pp. 398–400, 1924), was established by growth in pure culture on standard agar media.

Viable conidia may be found at any time of year, extruded from erumpent acervuli in heaps bound together by a matrix; they are adapted to distribution by splashing rain to longleaf pines in the so-called 'grass' stage (the first three to five years of life, during which the oldest dry needles cling round the stems of the seedlings, imparting to them the aspect of tussocks of dead grass, with upright spotted needles in the centre). The perithecia are initiated in stromata bearing concurrently both spermogonia and carpogonia, and take six to eight weeks to reach maturity. The ascospores are disseminated by air currents.

The brown spot pathogen being a member of the Dothideales and pigmented throughout, it appears to be most suitably accommodated in the phacodidymous, aparaphysate genus *Systremma*, as defined by Theissen and Sydow (loc. cit., xiii, pp. 149–746). Controlled fires appear to offer the best prospects of combating the disease.

Hirt (R. R.). **Relative susceptibility to Cronartium ribicola of 5-needled Pines planted in the east.**—*J. For.*, xxxviii, 12, pp. 932–937, 1940.

Studies were conducted in 1932 and 1933 at Warrensburg, and in 1936 and 1937 at Syracuse, New York, to determine the relative susceptibility of 11 species of young five-needled pines to *Cronartium ribicola* [*R.A.M.*, xviii, p. 3]. Within each site the trees were exposed to natural infection from black currants and later grown in plantations, where they were protected from further infection by the methods recommended by the U.S. Dep. Agric. The trees were regularly examined for blister rust cankers until the end of 1938. *Pinus lambertiana*, *P. excelsa*, and *P. parviflora* died in such large numbers during the first winter after inoculation as to preclude their tabulation in the final results, though the last-named was observed to develop some infection. *P. cembra* var. *helvetica* failed to contract the disease, thereby confirming its European reputation for virtual immunity. *P. monticola* and *P. flexilis* were more susceptible than *P. strobus*, and *P. strobiformis*, *P. peuce*, *P. koraiensis*, and *P. aristata* were more resistant, the weighted average differences being calculated as + 0·45, + 0·30, 0, — 0·02, — 0·32, — 0·60, — 0·68, and — 0·71, respectively, the + or — signs indicating more or less infection, respectively, than on *P. strobus*.

Lamb (H.) & Sleeth (B.). **Distribution and suggested control measures for the Southern Pine fusiform rust.**—*Occ. Pap. sth. For. Exp. Sta.* 91, 5 pp., 1 map, 1940. [Mimeographed.]

This is a summary of the present position in regard to the distribu-

tion, host range, and control of the pine-oak rust (*Cronartium fusiforme*) [*R.A.M.*, xix, p. 173] in the Gulf and South Atlantic States of the American Union, where its elongated or spindle-shaped cankers on seedling stems and branches are characteristic and familiar to foresters, especially on slash and loblolly pines (*Pinus caribaea* and *P. taeda*), *P. palustris* being moderately, and *P. echinata* highly, resistant. Teleutospores are produced in abundance on the water and willow oaks (*Quercus nigra* and *Q. phellos*), and in descending order of profusion on *Q. laurifolia*, *Q. marilandica*, *Q. cinerea*, *Q. rubra*, and *Q. catesbaei*, *Q. alba*, *Q. stellata*, and *Q. virginiana* bearing few or none.

The percentage of infection was found to range from under 1 to over 80 per cent., the heaviest losses usually occurring in south-east Louisiana, southern Mississippi, and southern Alabama, damage of medium extent in southern Georgia, northern Florida, and southern South Carolina, and relatively inconsiderable injury in a zone west of the Mississippi and the northern parts of the Gulf and South Atlantic States, including a large portion of Florida. Surveys made from 1937 (when the presence of the rust was first demonstrated in southern pine nurseries) to 1939 revealed serious losses in the zone of maximum infection, amounting to between 15 and 35 per cent. in *P. taeda* nursery stock and up to 15 per cent. even in the semi-resistant *P. palustris*. Seedlings contracting infection by *C. fusiforme* in the nursery may be regarded as a total loss, and the same generally applies to saplings, especially of *P. caribaea*, whereas older trees may survive the attack for a number of years.

Suggested control measures include the eradication of oaks from the vicinity of pine nurseries (an oak-free zone 1,500 ft. wide apparently reduced infection at one nursery); late sowing; spraying from the time of the removal of the cover from the seed-beds until 1st June, bi-weekly for the first three weeks and then weekly, with 4–4–50 Bordeaux mixture plus liquid santomerse (1 pint per 100 gals.) or a linseed oil-soap emulsion (6 lb. raw linseed oil and 6 lb. fish oil in 6 pints water per 100 gals.) as a spreader and sticker, using high-power pressure sprayers if available; pruning away all branches with cankers less than 2 ft. from the stem; and the exclusion of infected seedlings from consignments destined for regions in which the rust is at present of little or no importance.

ACREE (RUBY J.). **Temperature as a precision factor in chemically distinguishing Cronartium ribicola and C. occidentale.**—Abs. in *Phytopathology*, xxxi, 1, p. 1, 1941.

A microchemical colorimetric $P_H$ technique for the differentiation of *Cronartium ribicola* and *C. occidentale* [*R.A.M.*, xviii, p. 73] has been in constant use since 1937 in the identification of these two pine rusts in connexion with the California eradication programme, for the most part with excellent results. After eliminating all other sources of error in an attempt to account for the anomalous results obtained in October, 1938, and July, 1940, when the working conditions provided temperatures of 60° F., and in the 'upper nineties', respectively, changes to the 'seventies' afforded the necessary means of discrimination. Further

tests showed that temperatures below 70° and above 90° were unsatisfactory for the purpose in view. The success of the procedure being probably dependent on a difference in the permeability of the teleutosori of the two species, involving $P_H$ activity under the control of temperature, it is not to be expected that an unduly wide temperature range would serve the object of the studies.

HELPHENSTINE (R. K.). **Quantity of wood treated and preservatives used in the United States in 1939.**—*Proc. Amer. Wood Pres. Ass.*, xxxvi, pp. 422–447, 11 graphs, 1 map, 1940.

During 1939, 221 wood-preserving plants were in active operation in the United States, the same number as in 1938. Of these, 153 were pressure plants, 520 open-tank, while 16 were equipped with facilities for both methods of treatment. During the year a total of 245,219,878 cu. ft. of wood was treated, representing an increase of 998,436 cu. ft. (0·41 per cent.) over the previous year's figures. The consumption of creosote amounted to 163,864,259 gals., a decline of 2,319,632 gals. or 1·4 per cent. as compared with 1938. Reductions were also registered in the consumption of creosote-petroleum mixtures (9·03 per cent.) and pure zinc chloride (35 per cent.), whereas chromated zinc chloride, Wolman salts, and zinc-meta-arsenite showed increases of 751,452 lb. (41 per cent.), 330,036 lb., and 20,827 lb., respectively, over the previous year.

HUDSON (M. S.) & BAECHLER (R. H.). **The oxidation of creosote—its significance in timber treating operations.**—*Proc. Amer. Wood Pres. Ass.*, xxxvi, pp. 74–111, 2 figs., 25 graphs, 1940.

Among the conclusions drawn from this intensive study at the Forest Products Laboratory, Madison, Wisconsin, on the effects of the oxidation of creosote on its wood-preservative properties are the following. Oxidation is largely responsible for the physical changes undergone by creosote during pressure treatments, the wide differences in the reaction to the process of the various samples tested being apparently related to their tar acid content. Thus, creosotes of low specific gravity and high tar acid content, such as are produced by low-temperature carbonization, suffered decrease of toxicity towards the wood-destroying fungus Madison 517 [? *Polyporus tulipiferus*: *R.A.M.*, xvii, p. 5], the minimum lethal concentrations before oxidation of two such samples (vertical retort and lignite tars with original tar acid contents of 16·4 and 44·6 per cent.) being, respectively, 0·07 and 0·08 per cent., and after oxidation 0·12 and 2 per cent. On the other hand, creosotes with a very low tar acid content tend to acquire a slight increase of fungicidal activity as a result of oxidation.

STARKER (T. J.). **Preservative treatment of fence posts : 1939 progress report on the post farm.**—*Bull. Ser. Ore. Engng Exp. Sta.* 9a, 3 pp., 1 fig., 1940.

Further particulars are given of the condition of various series of fence posts treated by different preservative methods at the annual inspection of the Oregon State College, School of Forestry 'post farm'

in October, 1939 [*R.A.M.*, xix, p. 631]. Notes are also given on the treatments applied to a further ten series laid down in 1938–9.

NETTLES (W. C.). **A new method of impregnating green fence posts: a preliminary report.**—*J. econ. Ent.*, xxxii, 5, pp. 703–704, 1939.

Satisfactory results have been obtained at Clemson College, South Carolina, in the preservation against insect and fungal damage of green loblolly, short leaf, or slash pine [*Pinus taeda*, *P. echinata*, and *P. caribaea*] by the following method. The posts are cut into 6 ft. lengths and the top end immediately immersed for three hours in a trough or half of a wooden barrel containing a solution of copper sulphate sufficient for the absorption of $\frac{3}{4}$ lb. of the chemical per cu. ft. of wood; a 1 in. disk is sawn off the basal end to remove resinous material and this end placed in the solution for 24 to 48 hours, after which the post is taken out, the ends again reversed, and stood up for two to four weeks, or until thoroughly seasoned. In order to treat four posts 6 in. in diameter, 14 pints of solution would be required, the corresponding amounts for four of 5 in. in diameter, two of 4 in., and two of 3 in. being 10, 3·5, and 2 pints, respectively, and the approximate cost of 1, 1·75, 2·5, and 3·5 pints (the quantities necessary for the treatment of 0·29, 0·52, 0·81, and 1·10 cu. ft. wood, respectively), 2, 3·5, 5, and 7 cents, respectively.

FREITAG (J. H.). **A comparison of the transmission of four Cucurbit viruses by Cucumber beetles and by aphids.**—Abs. in *Phytopathology*, xxxi, 1, p. 8, 1941.

The most efficient insect vectors of four cucurbit viruses occurring naturally in California were experimentally determined. Squash [or vegetable marrow] mosaic was readily transmitted by the western striped and twelve-spotted cucumber beetles (*Diabrotica trivittata* and *D. soror*), but infrequently by aphids; *D. trivittata* infected 23 out of 25 plants and *D. soror* 8 out of 25, while of eight species of aphids tested, five conveyed the virus from diseased to healthy plants in only 13 cases out of 245. Cucurbit ring mosaic was transmitted by both beetles and wild cucumber (*Echinocystis fabacea*) mosaic by *D. soror*, but neither by aphids, which were the most efficient vectors of western cucumber mosaic.

WHITEHEAD (T.). **A summary of seven years' work on varieties of Swede.**—*Welsh J. Agric.*, xvi, pp. 99–110, 1940.

A tabulated account is given of the writer's trials at Aberystwyth, from 1933 to 1940, of a number of popular swede varieties for their reaction to different factors of agricultural importance, including the following diseases: club root (*Plasmodiophora brassicae*), crown and root rots (*Bacillus carotovorus*) [*Erwinia carotovora*], dry rot (*Phoma lingam*), brown heart (boron deficiency), mildew (*Erysiphe polygoni*) [*R.A.M.*, xiv, p. 807], and from 1938 to 1940, physiological splitting of the roots. Garton's White Fleshed showed average resistance to most diseases, except dry rot, by which it was much less affected than

most of the other varieties. Majestic was resistant only to the crown rot phase of *Erwinia carotovora* and to physiological splitting of the root. Wilhelmsburger, on the other hand, proved resistant to *E. carotovora* in the roots but succumbed to infection by the same organism in the crown; it was also susceptible to physiological split and brown heart, but more resistant to club root than any of the other varieties tested, and therefore safe for use on contaminated land. Magnificent was uniformly susceptible to the diseases under observation, but showed some resistance to physiological split, while Improved Lord Derby was resistant (in a moderage degree) only to mildew. Magnum Bonum was fairly resistant to club root, crown rot, and root rot, but was susceptible to all other diseases, especially to mildew. Superlative showed marked resistance to brown heart, mildew, and physiological splitting of the root and average resistance to the other diseases, except dry rot, to which it is definitely susceptible. Conqueror was severely attacked by club root and brown heart, but showed moderate resistance to the other diseases. Up-to-Date was resistant only to *E. carotovora*, especially in the roots, and to physiological splitting, while Purdy's was susceptible to all the diseases except club root. Tipperary showed definite resistance to crown rot, but was susceptible to bacterial invasion of the roots and moderately resistant to the other diseases included in the tests. Definite susceptibility to club root and crown rot was shown by Caledonian, while Model was below the average in disease resistance, except to brown heart. Studsgaard Bangholm is comparable to Wilhelmsburger in its resistance to *Plasmodiophora brassicae*, and was further found to be definitely resistant to root rot and moderately so to crown rot and brown heart. Kinaldie's only recommendation is a tendency towards resistance to mildew.

DENNIS (R. W. G.). **Rhizoctonia rot of Swedes.**—*Nature, Lond.*, cxlvii, 3716, p. 87, 1941.

Magnificent and Tipperary purple-topped swedes growing at East Craigs, Corstorphine, Edinburgh, showed slightly sunken, putty-coloured lesions generally bearing closely spaced, faint zone lines, and a shallow, dry, fibrous, yellowish-brown rot. The condition was distinguished from that due to *Phoma lingam* by the absence of fructifications and the presence of a pink margin. All the lesions were associated with mechanical injury to the root. The putty-coloured, pink-bordered lesions were confined to the purple upper part of the root, shallow, blackish-brown, roughly circular lesions occurring on the part under the soil. Isolations from diseased tissues (above and below ground) consistently yielded a strain of *Rhizoctonia* [*Corticium*] *solani* indistinguishable in culture from those obtained from sclerotia on potato tubers [cf. *R.A.M.*, iv, p. 443; viii, p. 477; xii, p. 262].

Inoculations on mature Tipperary swede roots with strains of *C. solani* from (*a*) affected swedes, (*b*) sclerotia on the surface of a Di Vernon potato tuber, and (*c*) dead tissue below a bruise on a Golden Wonder potato tuber were made in the laboratory. Strain (*a*) inserted into cuts produced rots identical with those noted in the field, but portions of a culture of this strain placed on uninjured root surfaces had no effect.

Strains (*b*) and (*c*) caused slight browning of the edges of wounds, but produced no rotting during six weeks.

The disease was severe in the field on about 1 per cent. of the Tipperary roots. This appears to be the first record of this fungus causing rot of swedes under field conditions in Great Britain.

NEWHALL (A. G.). **Host range and overwintering of the Lettuce, shot-hole or anthracnose fungus, Marssonina panattoniana.**—Abs. in *Phytopathology*, xxxi, 1, p. 17, 1941.

*Marssonina panattoniana*, the agent of anthracnose, shot hole, or ring spot of leaf and head lettuce, occurs sporadically in market-gardens in New York State [*R.A.M.*, ix, p. 224] on early spring and late autumn outdoor plantings, whence it finds its way into greenhouses. Inoculations with spore suspensions of the fungus resulted in the successful transference of the disease from cultivated lettuce to the native species *Lactuca scariola* and its var. *integrata*, *L. spicata*, and *L. canadensis*, while the following, supplied by R. C. Thompson, also contracted infection in the seedling stage: *L. altaica*, *L. laciniata*, *L. saligna*, *L. virosa*, *L. indica*, *L. graminifolia*, and *L. muralis*. Soil from below diseased plants was found to harbour the fungus for three, but not for six months. Infected plants of *L. scariola* and its var. *integrata* have been found growing wild in two New York counties, and lettuce seedlings were infected with inoculum from this source, indicating that the pathogen probably overwinters on the wild species in question and possibly on others.

NEWHALL (A. G.). **An undescribed storage rot of Celery.**—Abs. in *Phytopathology*, xxxi, 1, p. 17, 1941.

A serious storage rot of late celery, for which the name 'greenish-black rot' is suggested, causing losses in five counties in western New York, has been traced to a fungus described by [Johanna] Westerdijk in 1924 as *Cercospora cari*, the agent of caraway anthracnose [*R.A.M.*, xviii, p. 154]. Infection appears to originate in the soil, although the first symptoms rarely develop until after eight or nine weeks in cold storage, when a soft rot progresses rapidly upwards on the butt ends. None of the twelve varieties tested on infested muck soil proved markedly resistant, though Easy Bleaching, Utah, and Columbia suffered somewhat less than Giant Pascal, Golden Plume, and Meische's Improved Golden. The pathogen is characterized by a coarse, deeply coloured, torulose mycelium and sparse hyaline to subhyaline, falcate conidia, the appendage on the basal cells of which properly excludes the fungus from the genus *Cercospora*. Growth in culture takes place between 0° and 27° C., with the optimum close to 15°, and between $P_H$ 3·35 and 7·32 with the optimum near 5·3. Organic mercurial compounds, the use of which is regarded as unsafe, were the only effective preparations among ten fungicides tested for the control of the rot.

SHOEMAKER (J. S.). **Celery in Alberta.**—*Bull. Univ. Alberta* 35, 52 pp., 13 figs., 1940.

The following items of phytopathological interest occur in this

bulletin. Cracked stem of celery [*R.A.M.*, xvi, p. 792], due to lack of boron, may be controlled by applications of borax the following year at the rate of 10 lb. per acre near the base of the plants about a fortnight after they are set out, either dry and mixed with sand to give bulk, or in the form of a stream spray.

Unbalanced water relations are a significant factor in the development of blackheart [ibid., xiv, p. 343], injury from which is further increased by any check to growth and high temperature. The centre or heart leaves turn blackish, and the tips of the older ones assume a brownish-black tinge and shrivel up. The most effective control measure is the maintenance of conditions providing for a steady growth of the plants, keeping the soil moist but not waterlogged, and cutting the crop as soon as it reaches maturity before the hot weather sets in.

The most prevalent diseases of the crop in Alberta are late blight [*Septoria apii graveolentis*: ibid., xv, p. 553; xviii, p. 780], bacterial blight [*Erwinia carotovora*: ibid., xiv, p. 142; xvii, p. 722], chlorosis, *Sclerotinia* drop [*S. sclerotiorum*: ibid., xx, p. 4], and pink rot [caused by the same pathogen; ibid., xviii, p. 789]. The blights may be effectively combated by spraying with Bordeaux or Burgundy mixture or dusting with copper-lime (20–80), the latter being the method of choice in most celery-growing sections. Two to four applications in the seedbed are a wise precaution against the later development of infection in the field, where the quantity of dust needed for the protection of the growing crop by weekly treatments ranges from 15 to 35 lb. per acre according to the age of the plants. Seed over two years old needs no treatment, but new stocks may be immersed for 25 minutes in hot water (118° to 120° F.), half an hour in formaldehyde (1 in 240), or 20 minutes in mercuric chloride [proportions not stated], preceded by 30 minutes' soaking in lukewarm water and followed by thorough rinsing in running, or several changes of fresh, water.

Rotation with non-susceptible crops and soil sterilization are suggested as possible means of controlling *S. sclerotiorum*.

The symptoms of stunt or yellows noted in some parts of the province differ from those reported elsewhere, and further studies are necessary before any definite pronouncements can be made concerning the disease.

Brown (B. A.). **Boron deficiencies in Connecticut.**—*J. Amer. Soc. Agron.*, xxxiii, 1, p. 85, 1941.

In E. R. Purvis's list (*Proc. Soil Sci. Soc. Amer.*, iv, 1939) of the crops affected by boron deficiency in 24 States, only lucerne, celery, and rutabagas were reported as suffering from this condition in Connecticut. In further experiments at the Storrs Agricultural Experiment Station, mangels manifested very pronounced boron deficiency symptoms on limed sandy loam plots to which borax was not applied. Under similar conditions, spinach, lettuce, and cabbage yielded much more heavily with than without borax, soy-beans made slightly better growth, whilst string beans [*Phaseolus vulgaris*], carrots, and tomatoes failed to respond to the treatment.